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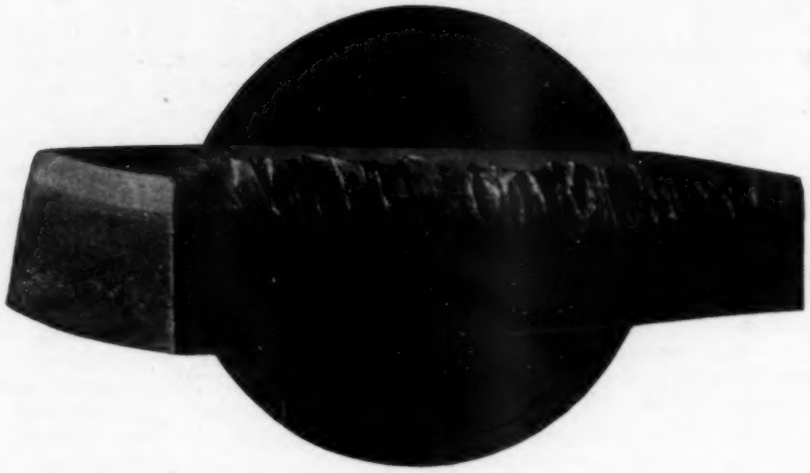


BABBITTING

as a positive operation

By Chester B. Lord

Associate Editor

GOOD babbitting, mechanically speaking, depends upon a single factor. As good health is said to wait upon good digestion, just so does good babbitting wait upon good tinning. It is no joke when a number of 18-in. bearings, each representing, with the chips, which cannot be remelted, 250 lb. of high grade babbitt, are rejected because of a hair line opening between the babbitt and the top of the half-bearing shell. One or two such experiences cause the average superintendent to hunt for both reason and cure — even though he feels sure the rejections were unnecessary, as he usually does.

When one begins to analyze, the first fact he learns is that, when a really large half-bearing is babbitted, most of the heat must be carried away by the outer bearing shell. Because of its shape, the shell has a tendency to spread at the top when heated. Heat is transmitted much more slowly by soft steel than by the babbitt metal, and the shell is still expanding after the babbitt is set. Unless there is a strong bond between the two at the top of the shell, they are likely to pull apart at that point. A dovetail close to the top, or puddled tinning will prevent this.

It is obvious that if the tinning adheres to the bearing shell satisfactorily, the babbitt when poured will adhere also, or better still, cohere or incorporate itself into the tin. There is no excuse for poor tinning because it can be done as slowly and in as many operations as necessary. Therefore, there can be no mechanical failures.

A properly tinned surface requires no anchors, and conversely, a properly anchored bearing needs no tin, but small bearings cannot be anchored properly and large ones are not. It was the lack of dovetails near the upper edges, and the difference in expansion that, in one instance, caused several large bearings to be rejected; had

the upper edges been properly tinned (and *properly* must be emphasized) the babbitt would not have shrunk away from the shell even though it lacked a dovetail and was bevelled to a thin edge at that point. When the engineer of the firm that furnished the babbitt was called in to arbitrate the rejections, he tried to ride two horses, declaring to one that the crack at the top was unnecessary and to the other that the anchoring was faulty and that on an 18-in. bearing the difference in the shrinkage factors of the two metals would cause them to separate, especially when the upper part was bevelled.

THE customer claimed, and rightly I believe, that oil would work in between the bearing and the shell, and that the vibration of the shaft would set up hydraulic pressure or fatigue strains that would in time loosen the babbitt clear around the bearing shell. As will be pointed out later, it is usually this slipping of the babbitt under vibration or hammering that makes the bearing loose. When I did not know how to make babbitt stick, I did not agree that a crack between the shell and babbitt was important, but now that I can remedy the situation I am willing to admit that it is harmful. The shop is often driven to a defensive attitude for this same reason, and what it really has in mind is not that a thing is not important, but that it is a common condition for which it has no remedy.

Regardless of whether the bearing shell is of bronze, steel, or cast iron, it may be tinned by the same old methods. There is no secret to it save attention to detail. Tinning is not an operation that has to be done quickly or continuously, as does babbitting itself. It can be done slowly, in as small increments as necessary. It is visible at all times. Any faults can be corrected: there is no excuse for a single failure.

The surface to be tinned should be chemically clean, and should not be touched by the hands, after cleaning. For fluxing purposes the standard solution of zinc sulphate or sulphuric acid cut with zinc, is used. Take a crockery jar, place in it a pint or more of sulphuric acid and add small pieces of zinc until the acid practically stops working. The effect of this solution is to clean the surface of grease and deposit a thin layer of zinc, just as copper sulphate, or "bluestone," and water deposits copper on a steel surface.

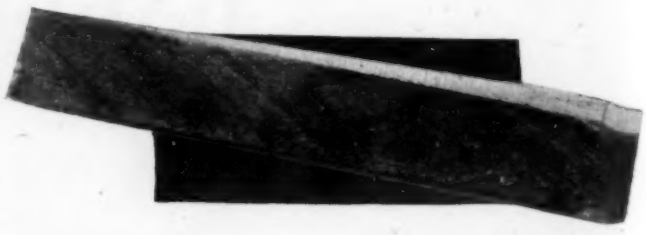
It is at this point that our trouble usually begins. We commonly use a wad of waste on a stick, or a bristle brush, to apply the zinc sulphate. Sulphuric acid eats both these materials, and as a consequence, threads and bristles are mixed in with the tinning. When the hot babbitt is poured, they generate gas and produce blow holes. In my own practice I have found a small soft rubber syringe much more satisfactory. These are called infants' syringes, and may be purchased at any drug store. With these the acid can be placed where wanted on hot shells, and they carry much more acid than a brush or waste mop.

For high-speed or heavy-pressure bearings, such as street car motor or steam turbine bearings, the babbitt itself can be used for tinning. For this purpose it is melted and run into thin rods. Where this is possible it should be done, otherwise a high tin solder should be used, as the bond must stand a considerable strain. In tinning, the bearing may be immersed in a bath, or it may be heated by a flame, depending upon its size. The flame, however, should never come into contact with the surface to be tinned, as a coating of carbon will be deposited—invisible perhaps, but sufficient to keep the tin from adhering properly to the surface of the metal.

Left to itself, the zinc sulphate does not wet the entire surface, but acts like water on a hot stove. To make sure that the entire surface is wetted, it is good practice to use a long handled steel bristle scratch brush such as is generally used in plating rooms. Rub the edges of the shell and the corners of the dovetail thoroughly with the brush, because it is at these places, particularly, that the babbitt must stick. In the absence of a wire brush, a piece of soft pine will do the trick.

With bronze shells, the tinned surface must be scoured with the wire brush or the pine stick to insure that the tin makes intimate contact with the shell. After this is done (and this is one of the necessary details), the tinned surface should be loaded or puddled with tin as thick as possible, particularly along the edges. If a tinned surface $\frac{1}{16}$-in., or more, thick can be puddled, it will make a perfect job. It may appear rough, but it will be effective because it and the babbitt will run together as one body.

I HAD occasion not long ago to demonstrate to an outside inspector the difference between a puddled surface and a wiped one. A quantity of bearings ready for babbitting had been rejected because of their appearance after puddling. I caused to be prepared a piece of bronze about 2 in. wide by 8 in. long. This was tinned and wiped lightly with a clean rag. One half of it was then puddled, and the other half left in a wiped condition. Dams were built around it and a half inch of babbitt was poured over the whole surface. The chief inspector was then invited to take a hammer and test both ends. The puddled end was perfectly solid but the wiped end was loose. The answer, of course, was that the babbitt and the puddled tin had run together, and in the case of the wiped surface there was nothing for it to run together with, except small irregularities. While it appeared tight, the hammer blow separated the babbitt from the small points to which it was adhering. On a bearing this might



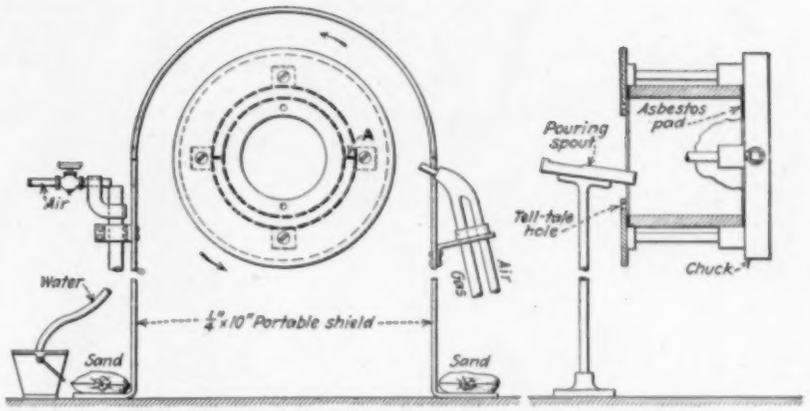
Bearing metal cast centrifugally on a cast iron liner with both rough and finished surfaces

or might not show up as a crack between the shell and the babbitt, either immediately, or later; but on a flat surface the hammer "gave it away." Here, then, is the only secret entering into positive babbitting: puddle the tinned surface.

Naval specifications on babbitting do not allow of remelting the chips turned from a bearing; but they do permit remelting the babbitt in the pot if it has been certified to by an inspector. There are two reasons for this precaution: first, the possibility of inferior babbitt being mixed with the chips; and second, the possibility of change through oxidation of the finely divided chips. Another advantage of the puddling method is that the

babbitt can be poured at a much lower temperature, barely sufficient to melt the puddled tin, thus avoiding much of this oxidation.

Steel, and cast iron bearing shells are admittedly somewhat more difficult to tin, but once this is done properly, the rest is just as easy as with bronze shells, and the bond between the babbitt and the shell is just as good. On cast iron and steel shells, the end of an old half-round file should be employed to scrape or scour the black spots where the tin does not stick. Apply acid with the syringe, then tin, and rub vigorously with the wire brush. Wipe the bearing with a rag, and other black spots will probably show up. Scrape these with the end of the file, and when the bearing is properly tinned, and not until then, puddle it thoroughly and there will be no possibility of failure in babbitting. If the tinning is good, the babbitting is good. Preparation is the whole of babbitting.



Fixture for heating, casting and cooling large bearings

This method may seem like a lot of trouble, but I have necessarily described the extremes. Actual practice will show it to be a practical production operation, not as formidable as it sounds.

The question that naturally occurs to the shopman is: whether this trouble pays for itself. The answer is: decidedly yes. The efficiency of a soft-metal bearing depends almost entirely upon its ability to stand up under the hammering of its shaft. There are several ways of obtaining the necessary firmness. In high-grade babbitt, copper is used for hardening, in the cheaper ones, antimony; but the more antimony used, the greater the wear in a given time. The use of this metal is, therefore, limited. The third way is to have the shell of hard material, with a thin layer of a softer metal so anchored that it cannot slide or slip.

ON certain high-speed diesel engines, even bronze bearings would not stand up, and the final solution was a fairly high carbon steel bearing shell with a thin welded bronze liner. Cast iron bearings with a thin layer of babbitt are also being used. Although there has been a lot of loose talk about the impossibility or difficulty of making babbitt stick to cast iron, under the method given above it is no more difficult than with bronze or steel. I have never babbitted a cast iron bearing, but I have babbitted cast-iron locomotive guides, which, because of their shape, I consider more difficult.

To test babbitting of cast iron, I had a ring about 3 in. wide made up from a piston ring casting having an inside diameter of about 10 inches. Part of the inner surface was left in its rough state and a light finishing cut was taken over the other part. After tinning, a babbitt liner $\frac{1}{8}$ in. thick was centrifugally cast. This liner was turned to zero thickness at one end to see how thin it could be machined without coming loose. The ring was then cut in small segments. Several of these segments were hammered heavily where the babbitt joined the cast iron, but the bond remained unbroken. The part shown at the left is now nearly two years old and it is still as firm as ever. A hammered piece is likewise shown, and it will be noted that, while the babbitt is distorted and broken, it has not been broken loose from its seat.

The efficiency of such a composite bearing depends upon the bond between the two metals and upon the density of the liner. This same relative efficiency is present in an ordinary bronze shell with a babbitt lining. A perfect bond resists movement, and, hence, will carry a heavier load, or will wear longer.

It is evident that if the lining is too thick, it can move within itself regardless of the bond, and it is therefore desirable to have the soft metal lining as thin as possible. It is equally evident that if the soft metal liner is not dense or hard it will squeeze out under a heavy load regardless of its anchor and its thinness, or else become dense at the expense of close fitting.

AS pointed out, a perfect bond with either steel or cast-iron may be readily made, but the density of the babbitt lining is not increased thereby. The methods usually employed to secure the desired density are peening, on large bearings, and smooth broaching on small sleeve-type bearings. In the one case, the peening, if thorough enough to affect the bearing qualities, is likely to loosen the bond. Smooth broaching affects only the surface. Packing, to be effective, must begin at the bottom.

The best and easiest way of increasing the density of a bearing is to babbitt it centrifugally. I have centrifugally babbitted bearings weighing nearly 400 lb. so that the babbitt had a pressure of 60 lb. per sq.in. Just how much this increased the efficiency or wearing qualities of the bearing I am unable to say, but the metal machined and looked different.

Centrifugal babbitting is simple for repetitive work, and machines can be secured that will cast several bearings at once. For intermittent work, the operation is not quite so easy, but an old grinder, or a variable-speed motor, together with a little ingenuity will furnish an apparatus that will not only make better bearings, but, in some cases, will save considerable time over the present method, particularly when recasting is considered.

The illustration above shows diagrammatically an apparatus on which the 400-lb. bearings referred to were babbitted, at a rate of 20 min. per bearing.

The time given does not include rigging up, but is figured from the time the flame was started until the bearing was cool enough to handle. That is a fair cooling time for nearly 400 lb. of metal.

In operation, a strip of press board is placed between the two halves of the bearing, one on each side, as shown at *A*. These act as parting pieces and as a seal between the two halves. These pieces do not extend into the shell quite so far as the depth of the babbitt, although I can think of no good reason why they should not. The

two halves are wired firmly together and placed on the face plate. It is necessary that the bearing be centered on the chuck, and that the front guard be centered on the bearing shell by some means, so that the thickness of the babbitt lining will be uniform. An asbestos pad is placed both at front and back. It must be remembered that we are not simply babbitting, but we are babbitting under considerable pressure, in this instance 60 lb. per square inch.

The guard is then slid back over the chuck, and the bags of sand are placed on its feet. The bearing is revolved and the torch is lit. Because of natural pressure conditions, induced by the rotation of the bearing fixture and the proximity of the shield, the flame tends to hug the bearing, and the heating time is short. The moment a stick of solder, touched against the inside of the bearing, starts to melt, it is time to pour the babbitt. Actually it can be done sometime previous to this, and probably without heating at all; but we are taking no chances in this instance.

Just the second the pouring is done, the water is started. The spray from this should be so fine that not more than a pint of water should be used for a bearing, and it should all pass away in steam.

It is unnecessary to mess up the floor, for if water is observed dripping on the floor, the spray is too coarse or it has been on too long. It is not effective after it has ceased to pass away as steam.

When we examine a finished bearing we discover another benefit of centrifugal casting. In a cream separator the heavy milk is thrown to the outside and the lighter cream is taken off at the center. When the bearing is revolved, the heavy babbitt metal flows to the outside: slag and impurities being lighter, are on the inner surface, but never below the surface of the babbitt.

The two sand bags on the feet of the guard are to take the shock if a bearing lets go. It is not considered best to place too much weight in the guard itself, and flying sand will not hurt anyone. Safety is an important consideration in babbitting heavy split bearings.

Machining From a Base Line

By J. T. Towlson,
London, England

THE BASE of every machine or fixture that goes through the shop should be, if possible, machined as a first operation. It may not, of itself, need machining, but a level base is needed for setting up the successive operations. It may not appear, at first sight, necessary that the base of a certain part should be machined, but let the machinist look closer. If he believes that a line, scribed and dotted on the part, will do, he should think again and question whether it is good practice to try to set up a casting, first for turning, then for the miller, then for the slotter, then for the drill, depending only upon a scribed base line. One can imagine a mechanic doing this in a semi-dark shop or even in a light shop with dark shadows.

Tables that are true, strips, and angle plates, are far more dependable than any lines that ever were marked, let the eyesight of the setter be ever so good.

The best way is to provide a starting line, set the part to this line, and machine it. This base should be the registering point for each successive operation.

SEEN · AND · HEARD

By JOHN R. GODFREY

Clean Shops—
Skill in a Japanese Shop—
Plan Shop Movings

IT ISN'T always easy to get the other fellow's point of view, even on simple matters. I recently visited a plant where an addition was almost completed. The wall between the old and new portions was down, the contrast between the glistening white walls of the new department and the dingy appearance of the old being very striking. I spoke about the contrast and expected to hear the guide say that they were to clean up the old building as soon as possible. Instead, he sighed and said that it was a pity that the new building would soon be as dark as the old one. Needless to say, he didn't qualify himself for the optimist class. And his view was not a complimentary comment on the policy of the company. I'm hoping that when the "big boss" notes the contrast he'll give orders to repaint the old shop.

DEFINITIONS are not always easy. We use the word "skill" very glibly to describe the highly intricate work of a tool or gage maker, and think of many other workers as unskilled. I have recently seen three types of work in Japan that all deserve the same title.

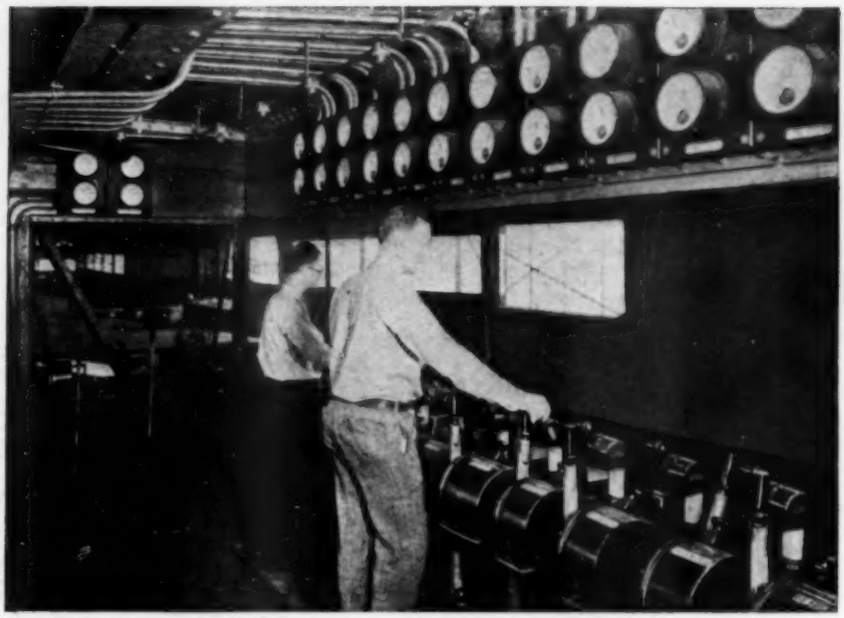
I saw a steam hammer crew take a plain square billet and forge it into a flat brake beam with round ends at a rapid rate. They broke down the ends with the hammer itself, then used special fullers, and finally flattened the centers and smoothed the edges, gaging the length carefully.

There is a mill where silk from cocoons is wound on reels of American standard for export to our country. The filaments are almost invisible to the eye, yet the girls start them through the proper guides, detect breaks and tie knots that are next to invisible, with amazing celerity. Lastly, a stone cutter was recessing a boulder to receive a bronze tablet. He was putting on the finishing touches when I saw him, squaring up the edges to receive the tablet. Instead of a chisel he used a cross-peen hammer, delicately removing trifling amounts of material by direct blows of the hammer. The toolmaker, in our country, receives about a dollar an hour, and earns it. The girl, in Japan, receives five cents an hour, the mason and the hammer man about 15 cents.

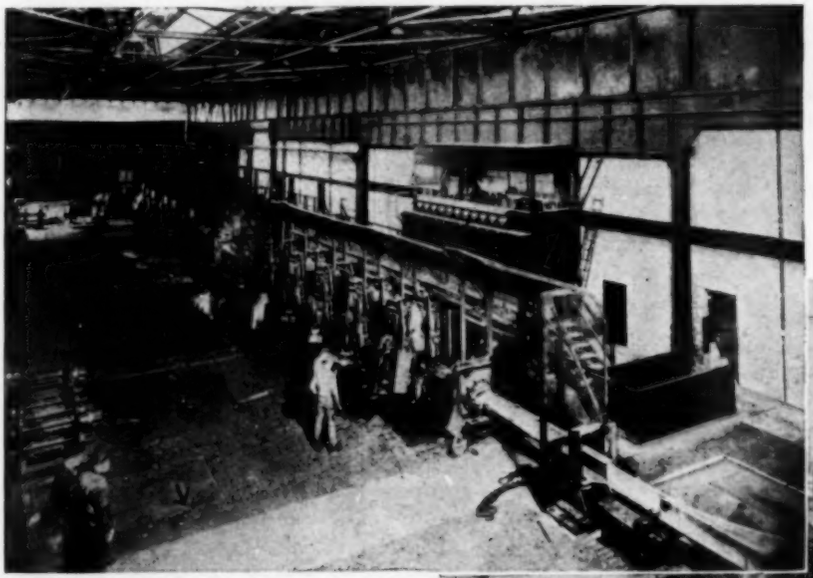
MOVING a shop is always a disturbing process. The larger the plant the greater the upsetting of production in most cases. Much of the usual confusion can, however, be eliminated by careful planning. The exact location of machines in the new plant can be plotted and all necessary provisions made for driving them in their new position. I recently visited a large new plant where the outline of every machine base was painted on the wood block floor and the name of the machine clearly indicated. Not much chance for confusion there when moving day came around.

Rolling Steel Strip at Half a Mile a Minute

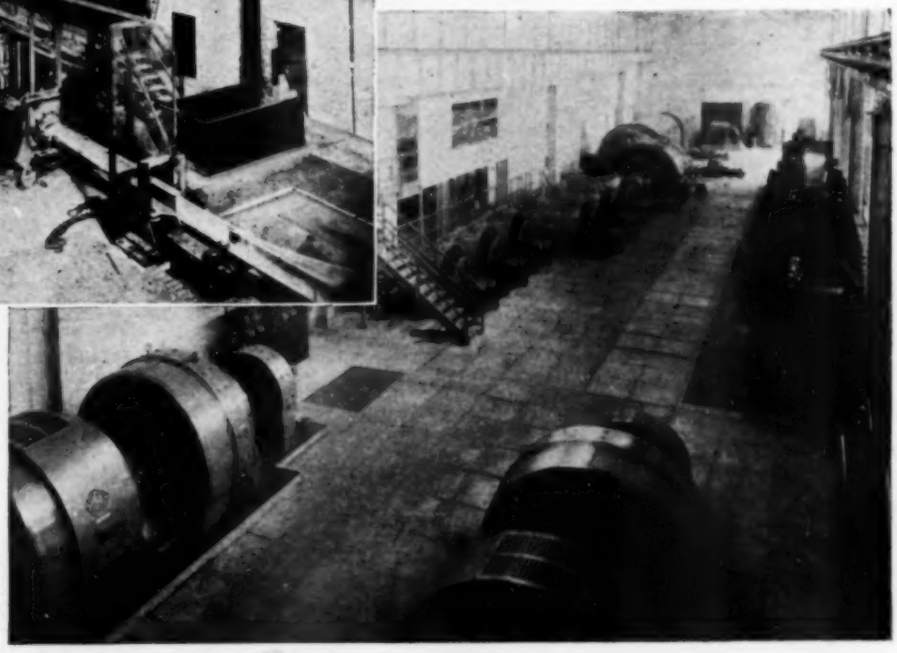
Photographs by courtesy of the General Electric Company



On page 579, Vol. 72, of the *American Machinist*, a view of a continuous rolling mill was shown. Here are three views of another installation in another plant. Above—Glass-inclosed operating pulpit of the 12-in. hot-strip mill, Sharon Steel Hoop Company, overlooking both the mill and its motor room. From this room the 45,000 hp. required to operate the mill are controlled. A microphone on the mill floor connected to a loudspeaker in the pulpit directs the operators



Left—General view of the mill. Bars 30 ft. long are rolled continuously to 12-in. strips varying from 1,500 to 1,800 ft. at a maximum rate of 2,400 ft. per min., or around 26 to 27 miles an hour



Right—Motor room of the mill. The rear of the operating pulpit may be seen at the upper left. Six d.c., 1,250-hp. motors mounted on a single bedplate and driving the finishing stages of the mill are at the left, beyond the pulpit stair. The 4,500-hp. double motor beyond drives the roughing stands. A speed range of from ¼ to full speed may be attained

EXECUTIVE · FORUM

Success or Successor?

"BRIGHT assistant you have there," said Bill Holland, watching the departing figure of Phillip Clifton. In his capacity as informal advisor on industrial affairs, Holland had learned to recognize ability when he saw it. He was favorably impressed by Clifton who had just finished an explanation of some innovations in production methods adopted by the Channing Metal Works. Although still in his twenties, Clifton had displayed a keen knowledge of shop practice and a natural faculty for developing improvements.

"Phil has a good head on his shoulders," agreed Frank Craig, Channing's general manager. "He should go a long way as a manufacturing executive."

"Just what I was thinking," said Holland. "Did you ever stop to think that you are training the youngster to fill your shoes? Suppose in a couple of years, the company should start one of its economy campaigns. By that time, Clifton could run this plant very nicely. And suppose it was decided to give him the job—where would you be?"

"You're doing a lot of supposing this morning, Bill, but I guess anything is possible. The answer is, I'm willing to take my chances. Besides there are two sides to the question. As long as no one is trained to take my place, I will remain as general manager. But I haven't reached the point where I'm content to stop. When Clifton is promoted to my position, I may be out, but on the other hand, I may be elected vice-president of the company."

"There's nothing like looking on the sunny side of things," said Bill. "I could tell from the way Clifton talked that you've given freely of your ideas and experience. These comprise a man's stock in trade, and you should consider not only your successor but your personal success. Why not let the youngster find out some of these things for himself and keep something up your sleeve?"

"Because that's not the way I operate," said Craig. "My idea is to give Phil the full benefit of my experience and let him build on that. This saves him a few mistakes, and he can concentrate on improving my methods. With my experience and his observation we should make a pretty good team."

What Do You Think About This Executive Problem?

In a large corporation is it safe to train a younger man to fill your position? Doesn't such a procedure often endanger your own future? Some feel that this is true while others contend that lack of a successor is a bar to one's own advancement.

How has this question worked out in your experience? *American Machinist* invites you to write a letter containing your ideas. Contributions accepted for publication will be paid for.

"I don't doubt that," Holland agreed. "I was thinking of the team's becoming a one-man affair."

"Another advantage is that he relieves me of a great deal of routine. During the past year, I attended several conventions and co-operated with the sales department by seeing several important prospects. There was a time when I felt I couldn't leave the plant. Things now go so smoothly when I am away that I have time to get acquainted with this industry."

"That sounds very well, and, theoretically, can't be disputed. But you must admit that large concerns make drastic moves at times. Many an executive has suddenly found the youngster he trained taking over his job."

"I don't know whether you really believe that or are just trying to get my reaction. I agree that you have to know the man you're training. I wouldn't want an assistant who didn't look ahead. At the same time, I wouldn't expend much effort on one who started a personal publicity campaign just as soon as he learned a little."

DISCUSSION

OF PREVIOUS PROBLEMS

Should Salesmen Design?

Whether salesmen should design, be consulted, or their advice sought regarding innovations in machine construction, depends largely upon the qualifications of the salesmen and the nature of the machine or contrivance in question. In the modern manufacturing concern, there is a very important man who is technically competent and in close touch with market requirements—the sales engineer. He most certainly should be consulted and his ideas given full weight.

However, let's not forget that in the technical field many of the salesmen are good, practical, competent men. Their ideas, therefore, ought to be respected. They should be encouraged to send in their suggestions which should receive careful scrutiny. Thus the management will be in a position to know the market requirements. —GEORGE BELBES, *Production Engineer, The Gaertner Scientific Company.*

Should Estimates Be Given Operatives?

In a well-organized shop, it is usual to calculate the working time for a certain job in advance, and the operative gets with the routing card the number of minutes he may normally work on this job. It is quite natural that one man will use more time than estimated and another less, but there will be some workers who use exactly the estimated time.

The number of minutes estimated or used is multiplied by a constant factor based on the operator's wage, and to my experience, difficulties in handling in this manner are infrequent. Of course, sometimes trouble may begin when the estimated time is calculated too short, but in these exceptional cases, a satisfactory arrangement for both parties, operative and estimator, is always possible. —ADOLF STEMWEDEL, *Berlin, Germany.*

Should Price or Payroll Be Cut?

This case of the Mid-City Machine Works illustrates an unfortunate type of organization wherein the president is general manager, but lacking in management ability. President Coakley's two replies to Works Manager Galloway disclose weakness, with lack of information and organization control.

The works manager has a strong argument and Comptroller Norton's points are well made. In some situations waiving a portion of the allocated overhead is excusable, but many a shop has allowed the practice to become a habit, with red-ink results. But if the president as general manager had a thorough grasp of his job, he would know this already. With his complete knowledge from conferences and reports—financial and otherwise—he would exercise good judgment at this time. He would know whether or not to go after the Dobbs Pump Company's special machine work to cover the works manager's problem, without attempting to figure in a commercial profit or take the maximum overhead factor, or to let it go to the competing concern, the Brown-Kellogg Co.

Only the responsible executive's complete knowledge and good judgment can answer the question heading this case.

—WALTER F. GILCREAS, *Cost Accountant.*

Should Special Work Be Segregated?

The best way, and perhaps the most profitable, to handle this is in a department for special work. This department should be equipped with standard machines, since the amount of any one part produced at a time will not warrant special equipment. The parts can be made in small lots at a reasonable cost in such a department. Experimental work can be done here as well. Material needed for plant maintenance can be processed without interfering with production routine. When demands for repair parts are not pressing and the regular production is behind, some of the regular work can be diverted to this department.

The investment required for equipment will not be unduly high because many machines can be transferred to this department from the main shop when the lines of production are straightened out. The removal of odd lot orders from the regular production shop will lower the amount of equipment needed.

—L. O. BROWN, *Toolroom Foreman, Holcomb and Hoke Manufacturing Company.*

Pensions or Leaky Payrolls?

The old age pension will be one of the next steps forward which this country will take in social reform. If properly administered, there need be no question of paternalism, charity, or socialism in such a pension. Someone must support the aged or incapacitated worker, and he himself is the logical party. At present, if he is incapable of self-support, his children may assume the burden at a time in life when expenses are likely to be large and income small; the imposition of such an added burden may influence their whole later life. If the family does not or cannot assume support, it will devolve upon the State. In either case, there will frequently be distress and unhappiness.

A system should be imposed by law in which a portion of the income of anyone gainfully employed would be automatically impounded, with the addition of a similar contribution by the employer as a legitimate tax upon industry, the

funds to be held in trust by the State and in due course used to defray the cost of the pension system. Such a system would cause the worker to provide for his own old age and spare him the humiliation of accepting charity or of being a burden to his children. It would be positive in action and would not possess the defect of group insurance schemes which virtually assess a premium upon the employment of older people, resulting in their discharge when a certain age is reached and preventing their further employment.

—Douglas L. Parkhurst,
U. S. Coast and Geodetic Survey.

Sales or Sincerity?

While it is a very tantalizing situation for a salesman to see a good order go by, it is even more annoying to lose connections already established, through failure to deliver on schedule. The latter invariably happens when the salesman, anxious to gain new business, shaves time estimates that have been already cut to the lowest possible by a capable and efficient production manager. A reputation for reliability in filling orders on time is a very valuable asset in these days of keen competition. Salesmen who jeopardise the company's good name by rash commitments should be "brought back to earth" by a reminder to get in touch with the production superintendent before submitting doubtful time estimates. Close co-operation between the sales force and the production department will aid in getting new business and holding the goodwill of the old customer. —Robert S. Alexander.

Should Special Work Be Segregated?

Special work like experimental, model, or replacement work needs special tooling, and if allowed to proceed along with the standard product, will always be pushed to one side. The schedule on production, will and must take first place.

To overcome this, it is our practice to send all specials into the one department known as the experimental and jobbing shop. This department opened up a splendid place to utilize the old hands, whose skill is of higher value than their speed, and who are excellent teachers for the apprentices. Give these old hands some of your old machines that have done their bit in the production lines, and both will give you a good return on your investment.

We find that by making one department responsible for specials, they are picked up and followed through quickly. Should they get overtaxed with work, which does happen, the jobbing shop foreman gets into contact with foremen in the production line and borrows a machine or tools. In our line of business we receive orders for specials, ranging from one to twenty pieces, 70% of which come again as repeat orders for 100 or more. —C. L. Henry,
Nottingham, England.

Who Should Do the Firing?

To fire a man without notice is unfair to the man and contrary to the principles of modern management. A foreman's authority is not in any way affected by his incapacity to dismiss a man who does not turn out satisfactory work at a particular job. His actual authority should cover an entirely different sphere of activity. Decidedly he is responsible for the work to be turned out in his department, and consequently he must have the right to decide whether a man is fit for certain work assigned to him.

Scientific selection of the worker will bridge a wide gap between the relations of employer and employee. A man will gain in self-confidence and prove more ambitious if he is placed at the work he is best fitted for.

Of course, there are still many who will argue in favor of a shorter method of dismissing workers, thinking it will save time and trouble. In the long run, however, this will not prove true. A shorter method means more labor turnover, dissatisfied workers, and therefore bigger overhead and less efficiency. —Jacob Decker,
U. S. Rubber Company.

To Whom Should the Chief Inspector Report?

As a former inspector, the writer has experienced several methods. At my first job defective work was reported to the shop foreman; my responsibility ended after checking to the drawing, and for finish. This system, which is economical, answered fairly well, and is practiced at many works. In my next job, being the first inspector the firm had employed, I became (in my opinion then) quite an important man. I was allowed to adopt my own methods, and to order what was necessary for the work. The firm had been tormented by complaining customers; the designer was blamed, and he suggested the need for inspection. Needless to say, I had no difficulty in justifying my existence.

We now turn to the question whether a standardization committee, general manager, or chief engineer, should receive the report. I prefer to dismiss the idea of a committee as being impractical. Of course, in a serious matter such as a batch of faulty cranks, the heads of departments would naturally consult together. But as a rule "too many cooks spoil the broth." Between the general manager and chief engineer an unqualified statement is hardly wise, for individuals vary, and their duties vary according to the size and policy of the firm. Unless these high officials handle the report personally, then the superintendent or head foreman might as well have it. The writer has always preferred the highest possible official to deal with his reports. They have power to make the necessary alterations, to get necessary appliances for accuracy, and to ginger up individuals or departments as required.

—Wm. Bryce,
Sheffield, England.

CHINA
as a machine market

The rickshaw still competes with the trolley in Shanghai. China's machine age advances but slowly

By FRED H. COLVIN
Editor, American Machinist

METAL WORKING in China has not yet reached the stage where it offers much encouragement as a market for machine tools and similar equipment. despite the fact that some are sold and that the manufacturers find it difficult to see why the market cannot be appreciably increased. In a few cities, such as Shanghai and Hongkong, where considerable business is done by foreign concerns, there are dealers in machinery of various kinds who display lathes, shapers, and the like on their sales floors. Many of these are crude in design and workmanship, some of the cheaper German makes being fairly prominent.

Repair and maintenance of machinery used in the textile mills and similar industries require machine tools, and as these are frequently controlled by foreigners, the machine equipment usually reflects their own nationality. Ship repairs also require considerable machine equipment, usually of a fairly heavy type, and as many repair shops are run by Europeans, it is but natural that machines of the same nationality should be found in those shops.

In addition to these, however, there are some native shops engaged in the manufacture of electric equipment, such as small motors, electric fans, and the like. Textile machinery is also made to some extent, but the work can hardly be called manufacturing as we know it. Price is said to be a great determining factor in the purchase of machinery by native shop owners or managers. It is also said that they fight shy of buying machinery that has been used by someone else—and this in spite of the fact that many used machines that have outlived their usefulness in shops where production is far more of an item than in China, would prove a real economy. Good used machinery would frequently serve their purpose better than the cheaper grades of new machinery which they buy in preference. But it evidently requires a change of thought in the Oriental mind to make them realize that used machines might be good investments. When it comes to automobiles, however, it is said that many used, and sometimes badly used, cars find a ready market.

Small native shops employ very little machinery. Stoves for heating purposes are hand made by riveting sheet iron into cylinders and attaching a top and a suitable base for the fuel. Many other articles are made in the same way. The sound of riveting and of various hand operations can be heard as one walks along almost any street in the native quarters, the workshop being in the front of the dwelling in most cases. The old bow, or fiddle drill, is still used, particularly by itinerant tinkers, but also in the small shops, and its cousin the spring pole lathe has by no means disappeared. With these methods still in vogue, and with labor working for a pittance and consequently having no purchasing power beyond a mere subsistence, the outlook for manufacturing is not alluring, and imports of machinery are not large.

With the increased use of motor vehicles there must be a demand for service stations and for the machinery which they use. But the limited miles of roads on which motor vehicles can run and the taxes imposed at will by any town on traffic passing through hardly indicate a rapid growth of motor traffic. Rickshaws abound in all

the big cities. They cost about $100 each. Many of these come from Japan, complete except as to the body which is built locally. In some cases the parts are imported, bearings, spokes, and rims coming from Germany or Japan, while tires are either British or Japanese.

It is quite possible that shop conditions in China may eventually change in such a way as to increase greatly the demand for machinery because of the new factory laws recently promulgated. These laws are very drastic as compared to present statutes, and, if enforced, can hardly fail to make machine equipment necessary. No child under 14 may be employed, although those of 12 and over who are now at work may continue. Women and children are prohibited from dangerous work and from hard manual labor. Eight hours is set as the legal day, but a 10-hour day is permitted in special cases. Annual vacations, sick leave, wages, profit sharing, and arbitration are also included in the law. These provisions are, however, so at variance with present practice that in the absence of a strong central government there seems to be no likelihood of their being enforced immediately. This assumption is based on the utter failure to enforce the edict regarding the celebration of lunar New Year, even the government offices being closed, in some cases, contrary to the law.

THE contrast between old customs and new laws will be appreciated when we learn that the average shop now works from 10 to 12 hours a day seven days a week. The only cessation is during the now illegal lunar New Year holiday when they shut down for two weeks, with pay. Many of the workers come from country districts and utilize this vacation to visit their families, while the proprietors and those who live nearby accept the opportunity to pay their respects to their ancestors' places of burial.

Railway shops need much new machine equipment. But considering their financial condition, the necessity for track maintenance, rolling stock, and ordinary upkeep which have been so sadly neglected for several years, the prospect of orders from this source is remote indeed. Some of the smaller roads have no shops of their own, and as a result, they run locomotives and cars as long as they can possibly be used before sending them to other shops where real money will be demanded for their repair.

There is no question that China will eventually become a good market for many kinds of machinery and of machine products. But those who know China best feel that it will take several generations to change the attitude of mind to the point of understanding the necessity for a strong central government, or, better yet, a genuine co-operation between two or more sectional governments. China is such a large country, with sections containing entirely different conditions, languages, and psychologies, that many feel it is too much to expect a real government from any one section that would be acceptable to the others.

When industrialization comes to China, as it will, a wise government, or several of them, can prevent much of the distress and unrest that has followed the rapid introduction of machinery in other old countries. China can absorb hundreds of thousands of laborers in road building, not as a charity, but as a means of adding directly to the wealth of the country. Every added mile of highway will open new possibilities of employment as well as help to eliminate the famines that now occur all too frequently and lack of roads prevent relief.

Though the present outlook for the sale of machines in China is not very bright, it does not mean that the market can be neglected with impunity if we are to share in it when it develops. There is perhaps no market in which the competition is more fierce or in which, except for discriminatory duties, there are fewer advantages for American manufacturers. China is nearly enough equidistant from the great manufacturing countries to equalize approximately the cost of transportation. British, French, and German interests are already strongly established, and while American machines also find their way into China, it is unwise to rest on the laurels already won. The situation must be carefully studied and its developments noted if we are to share in the business that may develop later. The excellent work being done by our commercial attachés at various points will be of great value to all who are directly interested.

Lastly, we must not overlook the effect of the political phase on our future business. Except for the discriminatory exclusion bill, we have been on very friendly terms with China for many years. Our return of the Boxer indemnity for educational purposes was a master stroke of diplomacy. But we all forget past kindnesses in the face of a present slight or humiliation, and discrimination always rankles. The manner in which we handle the problem of extrality, and it is a real problem regardless of theoretical arguments, may have a great effect on future business. Fortunately we are splendidly represented by the new minister, and there is every likelihood that the matter will be handled with the utmost diplomacy. But Congress is very likely to view questions of this kind more from sectional, vote-getting viewpoints, than from those of national or international welfare, and it behooves business men to keep tabs on their action as having a direct bearing on future business, for the new China is going to consider more than friendships of past generations and the prices of goods. Discriminatory legislation will have its effect on business when the new China gets into its stride, no matter how long its coming may be deferred.

The Care of Planer Belts

W. E. WARNER
Brighton, England

THE HEAVY load and constant shifting from one pulley to another cause planer belts to stretch and wear. When the table travel is short, the belt will heat, often with considerable slippage, due to the rapid rate of shifting. At times, the wear on the belt shifter may cause sharp edges to form, which will damage the edges of the belt unless promptly remedied. The shifter mechanism should be kept free-moving at all times by regular lubrication.

When used in a dry, hot shop for some time a planer belt may crack due to loss of moisture. The application of a good belt dressing will remedy this condition. An excellent dressing may be made of two pounds of edible beef tallow and one pound of cod liver oil. The tallow is first melted, allowed to cool slightly, the oil poured in, and the mixture stirred until cold. The surface of the belt should be cleaned with a bristle brush and the dressing applied with a camel's-hair brush in such quantities as will be absorbed.

Do's and Don'ts
IN VITREOUS ENAMELING

By C. D. CLAWSON
General Superintendent,
Chicago Vitreous Enamel Product Company

Large steel sheets are dipped in ground coat by hand, placed on power conveyors, and carried through gas-fired drying tunnels

ANY article attempting to give specific data concerning the application of ground and finish coats on steel must necessarily be limited to one particular vitreous enamel, working under certain well defined conditions. For this reason no specific rules will be given in this article; instead the discussion will be general in character, limited to successful standard practices in use today in leading stove and refrigerator manufacturing plants.

A ground coat is necessary on sheet steel articles since the average cover coat, particularly if it be white, does not develop sufficient adherence to the steel base on which it is applied. The general characteristic feature which distinguishes ground coats from cover coat enamels is the presence of the oxide of the metals cobalt, manganese, and nickel which promotes the development of a bond between the steel base and the enamel. The presence of these metallic oxides accounts for the dark blue color common to all ground coats.

Hair lines, blisters, grit, brittleness, ripples, runs, unevenness, and other banes of the enameler's existence may be avoided by following simple rules

▼

It is the usual practice to mill ground coat frits with raw materials that impart certain desirable properties to the enamel. For example, a group of materials coming under the general category of non-plastics and refractories, and composed chiefly of calcined clay, silica, and feldspar, are added for a threefold purpose: (a) to give a more open structure to the enamel when burned—claimed to reduce the tendency to fish scale; (b) to raise the maturing temperature and increase the burning range; and (c) to improve the draining of the enamel. Too much of any of these will make the enamel too hard to burn and may develop brittleness. A small amount of one or more of the materials in this group is generally desirable, tending to prevent the enamel from burning off the edges as well as giving it more body.

Another group of materials added in the mill is known as electrolytes or setting-up agents, the most common ones being borax, magnesia, ammonium carbonate, and some clays. After determining the proper "set" of the enamel, the amount of these materials added to the mill should be carefully checked. Any increase will make the enamel too "short" and the draining difficult. It will drain too slowly, hanging in depressions in the ware and on the edges. In the heavier portions, the enamel may not burn out properly, and blisters and hair lines may develop in later coats because of this.

If too small an amount of these setting-up agents is used, the enamel will drain too freely, running off the edges and developing a rippled appearance. Often water marks or runs will develop in the corners. The analogy of these two conditions may be seen by dipping a small article in skimmed milk and in whipped cream. In the milk the draining is too rapid, leaving the piece practically bare, while in the cream the article is left with a sloppy, uneven coating. The latter represents the short enamel. Both of these conditions have costly results and may be prevented by proper control of the mill additions of the setting-up agent.

If the ground coat is too finely milled, it will have the properties of a short enamel and will be difficult to apply evenly, besides presenting a real burning problem. It will burn off the edges and develop copper heads if the product is improperly cleaned. The burning range will be shortened and dark blisters may appear in the subsequent coats unless they are very carefully burned.

An enamel that is too coarse is difficult to apply smoothly. It generally drains with a rippled appearance and shows an orange-peel effect through the subsequent coats. When the enamel is removed from the mill it should immediately be put through a vibrating screen of 30 to 50 mesh. With sufficient care, it is possible to

use an enamel directly from the mill, but it seems advisable to permit the enamel to set from two to four days before use. A fresh enamel will not drain smoothly and its "set" will change rapidly as it is worked. This condition is probably caused by air which has been beaten into the mass by the revolution of the mill.

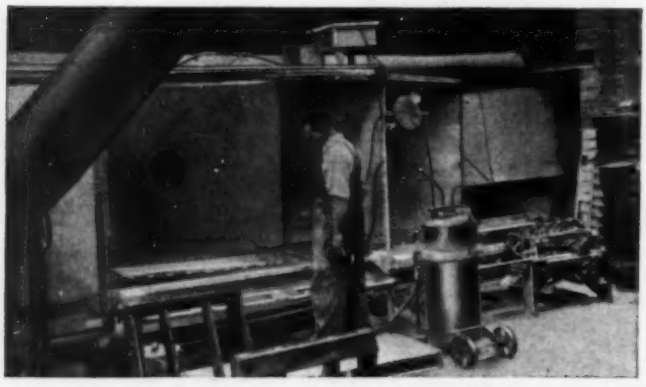
A great many methods have been advanced for measuring the consistency of the ground coat best suited for dipping. The most satisfactory one for general use is the weight of the ground coat remaining on the product after the excess has been drained off. It is best to use the dry weight. After determining from actual experience the best weight for the particular type of ware, a standard weight per square foot is determined.

IT is necessary to screen all additions to the dipping tank through as fine a screen as the grinding will permit. At certain regular intervals, determined by the amount of material coated per hour, it is advisable to empty the dip tank, wash it thoroughly, and rescreen all of its contents. This is to remove any foreign particles which may have fallen into the tank, and to break up any lumps of enamel gathered from the dried enamel falling in from the racks or dipping equipment. If this precaution is not observed, these lumps and coarse particles will appear on the burned ware.

After the piece has nearly completed draining, a second run or double drain may appear. This leaves the piece unevenly dipped, and the thinner portions may receive too much fire while the heavier deposits may not have enough. This fault may be corrected by proper setting-up of the enamel. If strict milling standards are adhered to and the enamel is permitted to age sufficiently, this trouble will not develop.

It is advisable to dry ground coats as rapidly as possible. In order to dry the enamel rapidly without getting water streaks, it is necessary to have good circulation in the dryer. Rapid drying in a room where no circulation exists is very likely to produce water streaks or develop a fragile enamel which will chip easily when handled before burning. Temperatures ranging from 200 to 250 deg. F. may be safely used, depending upon the circulation in the dryer.

For producing black edge ware, there are two methods

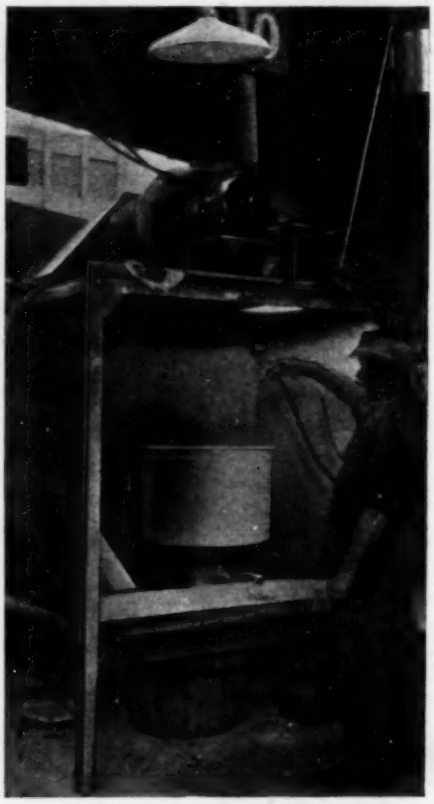


The finish coat is sprayed on flat sheets carried along a power conveyor

in use. One is to apply the black after the piece is burned in ground coat. The other method is more economical, as the black enamel is sprayed on the dry ground coat before it is burned, thus eliminating one burning operation. Like all short cuts, this last method requires more skill.

Black enamel that is applied before the ground coat is burned may be made from ground coat and black oxide. It should be ground much finer than ground coat enamel. If it is sprayed too heavy, the edge on which the black has been applied will probably blister and show hair lines; if too light, it will burn off, leaving the ground coat color showing through. It is difficult to give a set of rules for the application of this edging enamel as the necessary technique is best acquired by practice. It is, however, very poor practice to spray any part of the piece except those portions which must be a good black.

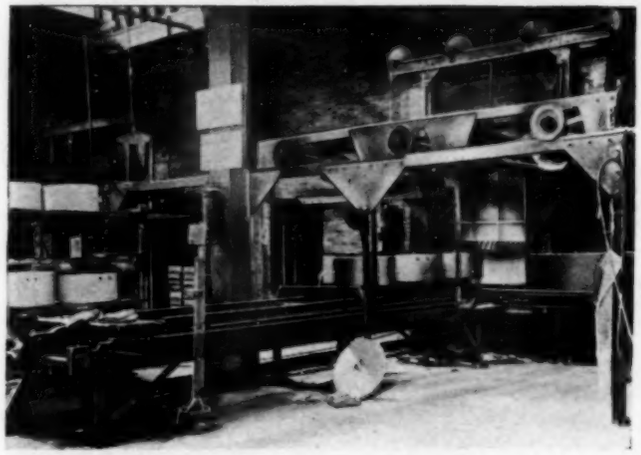
Two major faults may occur in the burning operation; under burning and over burning. Under burning results in fish scale and boiling of the ground coat in subsequent firings. It can be corrected by an immediate reburn. A badly over-burned piece should be redipped or resprayed in ground coat. If this precaution is not taken, steel blisters and small black specks may appear in later coats.



Round objects, such as this washing machine tub, can best be sprayed while mounted on a revolving table

The maturing temperature of some ground coats approaches the critical temperature of iron, and care must be taken that the ware does not buckle or warp. This is particularly true of the lighter gages. When 22- and 24-gage are used for flat work, the burning points upon which the work is supported in the oven should be not more than 4 in. apart and of even height. If some of the points are longer than others, the unevenness will show in the burned piece. It is good practice to check the burning points at least every two weeks, as bars with broken points may prove costly in use. A special tool can be made for repointing burning equipment, making the points of uniform height.

THE importance of process inspection cannot be overemphasized. All lumps or rough particles should be smoothed down. The burning should be checked and all good edges inspected. Many of the losses which occur in later operations could be prevented by comparatively cheap re-operation at this stage of the enameling processes. Certainly no builder would commence his super-structure until the foundation work was thoroughly laid and approved. In like manner, enameled ware should not be permitted to progress further than



Washing machine tubs just after the enamel has been burned in a gas-fired furnace

the ground coat until approved by a thoroughly competent inspector.

After the ground coat has been burned, the first white coat is applied and is fired until a good uniform gloss appears. If this coat is under-fired, it will appear dull and feel rough to the touch. If over-fired, the white will appear somewhat pitted. Process inspection of this coat is important. It is much easier and cheaper to correct work at this stage of completion than later.

There is some controversy concerning the burning of the two white coats. Very satisfactory results are being obtained, however, by burning each coat until a good gloss appears on the surface of the enamel.

It is poor practice to permit the burning points to become cold while burning cover coats. The enamel will not fuse completely where the ware is resting on cold points, particularly if these points are allowed to become blunt. Where the proper alloy is used, resharpening and straightening is easily accomplished without breaking the points.

Placing the product on the burning points requires care. If the piece is dropped on the points, the result may be "stars" where the enamel is fractured, similar to those produced by cold points. Because a lower temperature is used in the burning of the finish coats than in the burning of ground coat, it is not necessary to keep the burning points so close together. Warpage does not commonly occur at the lower temperatures.

Rough handling at the furnace after the piece is dry, and before burning, may cause tearing or crawling where the piece is the weakest; a severe twist may produce crazing at the corners.

Records of Minor Employees

By W. H. Malliet

THE OFFICIALS of many large manufacturing establishments expect the youths in their employ to be leaders in responsible positions, later on. Many of the boys employed in these plants overcome all difficulties and forge ahead to responsible positions. Their advancement comes as a result of apprenticeship courses in the factories, local evening educational schools, and proper instruction. To keep a check on the progress of the boys, some factories keep on file, cards containing records of their employees under 21 years of age. Front and back views of such a card are shown in the illustrations.

On the upper part of the front of the card is a place for the boy's name, date of birth, nationality, address, and date of entering into employment with the concern.

R. T. Co. Inc., Form O-57

RECORD OF BOYS UNDER 21 YEARS

Name Johnson, Thomas E. Entered 4/3/27

Date of birth 5/3/20 Age 17 Nationality American

Address 18 Central St E. Hanford.

EDUCATION		REMARKS
None		Good workman
Grammar	Graduate	Not fast
High	3 yrs	Worthy of Promotion
Special	Evening High (Drafting	Applied for drafting

EMPLOYMENT RECORD

Date	Dep't	No.	Rate	Left	To / Reason
4/3/27	16	81	30	V	To Some time drafting room
6/2/28	13	15	36		

Fig. 1—Front of record card for employees under 21 years of age

At our factory a small photograph of the boy's head is attached to the upper left-hand corner of the card, so that his facial character may be analyzed. At the left side of the card, in the middle, is a record of the boy's education, while the space at the right is reserved for remarks. Under this heading, notations are made of the boy's ability as a workman, and a short record of his deportment.

REPORT

	1927				1928				1929			
	Disp.	Att.	Qual.	Prod.	Dis.	Att.	Qual.	Prod.	Disp.	Att.	Qual.	Prod.
Jan.					A	B	A	A				
Feb.					A	B	B	B				
Mar.					A	A	A	A				
Apr.	A	B	B	A	A	A	A	A				
May	A	B	C	C	A	A	A	B				
June	A	A	B	B								
July	A	A	A	A								
Aug.	A	A	B	B								
Sept.	A	A	B	A								
Oct.	A	A	A	A								
Nov.	A	A	A	A								
Dec.	A	B	B	A								

Fig. 2—Back of record card, showing monthly gradings for a period of three years

The lower section of the card is reserved for the boy's employment record, whether he served in one department only, or was transferred. If the boy leaves the shop in which he is employed, the date and the reason for leaving are entered on this part of the card. On the back, a record of the boy's grade of work is kept.

The following narrative is a "case" presentation of the topic. It has been written to involve some of the questions that arise in the average shop. For guidance in preparing discussion the questions given at the foot of the page have been arranged

THE · FOREMAN'S R

The Safety Court

"ISN'T there any end to this safety business, Al? I am sick and tired of hearing about the subject. It's getting so I don't pay any attention to it any more."

"That's the trouble, big boy. Only not quite the way you state it. You have ceased to pay any attention to it, and the occasional reminder causes irritation because it awakens a subconscious sense of your having neglected the subject."

"Sho-sho! The whole brain process is explained in your usual learned and unconvincing manner. But I still ask, why do we have to do this thing over and over again?"

"Well, I notice that most of us keep up our insurance. We might let it lapse and renew it just before something happened, but personally I don't feel equal to foretelling when something will happen."

"Well answered, my good man, but tell me, what did you find out on your trip, anything interesting?"

"Yes. I visited a plant you would like to work in. Like every other plant, they have safety campaigns once in every so often. Everyone accepts the campaign good naturedly—and then forgets about it."

"I'd like to work there too. But what's the catch?"

"Well, they had an excessive number of accidents last year, and analysis seemed to show that the large majority of them were due to carelessness. To cure this they set up a court, and when a man is hurt without apparent reason, they try him for carelessness."

"But, what good does that do?"

"Judging from the way they have reduced the number of accidents, it does a lot of good. I think they are on the right track."

"That sounds like hitting a man while he is down. It doesn't raise my blood pressure, so far. What do they do next?"

"They give him a regular trial. The safety engineer is the prosecutor, and any one the man wants to choose is his counsel. The prosecutor attempts to prove that the accident was caused through the man's own fault, and the defense attempts to show that it was unavoidable or the fault of the company."

"As a scheme for giving employment to the shop lawyer, it's a peach, but what happens during the second week of the trial, Al, and what do they 'soak' him?"

"They fine him from one day to one hundred days; there isn't any second week or second day, and all the evidence is written."

"How come they fine him? You can't do that in this day and age."

"Yes you can. You just fine him ten days, for instance, not ten days' pay, and charge it against his record. When any one has accumulated 100 days, or is fined that much at one time, he is automatically discharged."

"How come they don't try the foreman instead of the man?"

Is such a court likely to be a source of ill feeling? Is a return to the policy of personal liability desirable? Does the delegation of responsibility make men less careful?

Contributed by W. J. Owens, Foreman, Newport Rolling Mills Company

Foremen are invited to discuss these questions vital to their work; of course the

'S ROUND · TABLE

DISCUSSION OF EARLIER TOPICS

Closing the Door to Late Comers

THERE seem to be three distinct types of late comers: first, the emergency; second, the occasional; third, the habitual.

The first case is usually due to sickness or accident. Think of closing the door to this man, who for loyalty, necessity, or desire comes to work after the regular starting hours.

The second case is due chiefly to carelessness or laziness, usually occurring on cloudy or stormy mornings. It seems more of an effort to get going when the atmosphere is heavy. This "later" can be very easily taken care of by the foreman, and does not present a serious problem.

In the third case, first and foremost a good example should be set by all supervisors being on time, on their toes, and ready to go at the whistle. The foreman can then carry that air of "Do as I do." With tact and patience these cases can be corrected.

Transportation may be a cause of any of the above. Just how far allowance will be made for this depends to a great extent on the supply and demand of workers. Never close the door on any of them, for what you may gain in punctuality you will lose in good will. It is a "goat getter" to find the door closed.

—JACK SARGENT, *Foreman, R. Wallace & Sons Manufacturing Company.*

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Keeping Machines on the Job

TO HAVE a general maintenance man is folly, because: (1) If he has to make the rounds of the shop and a general inspection of machines, he will have considerable on his hands unless he has one or more assistants, depending on the size of the shop; (2) Maintenance men who, from outward inspection or watching machines run, can tell whether the machine is functioning properly are very scarce and unusual; (3) A machine is to an operator like a pet dog to a man. The operator can tell whether or not his machine is running right: he is with it day in and day out. He can tell just as the man can tell when his dog takes sick. The operator will naturally inform the foreman of any irregularity; (4) The foreman makes several rounds a day and, in going around and watching a job run, can certainly see whether everything is O.K. or not. He is the man responsible for production and he knows that if everything is not right he cannot produce.

—CHARLES MANGER.

Too Much Co-Operation

LACK of co-operation between department heads is another way of saying that the higher executives have failed to harmonize the relations of the several departments, or having started the necessary machinery in motion, have failed to keep it going. Too much co-operation would be a rare thing to see. It would be very pleasing to know that if one department got into trouble another department would help them out. But how far this state of affairs could continue without unpleasant complications arising that would offset the good features, is another thing. I am afraid that a point would be reached where the concern would be operating, to all appearances, without a head. In my opinion that would be neither economical nor practical.

There is no reason why one department should not borrow one or two men for a short period without consulting the head of that group of departments. But if "a neck of the bottle" exists, it is the duty of that executive to straighten matters out. An assistant foreman should not take an active interest outside of his own department unless his superior deems it to be to the interest of his department to do otherwise.

—F. L. INGLERIGHT, *Superintendent, Bradford Motor Works.*

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New Drills and Old Men

THIS is a case of an old hand, who has not kept himself posted on the latest tools applying to his job, and who is not of an adaptable nature.

To force a man of this type is to make him more stubborn. It is just time wasted. Should this man refuse to use one of the new drills, take him at his word, and as only two machines are being ordered, let them be operated by two other workers. Leave Jackson with his old drill press, and by the time Williams is ready to introduce more machines of the same sort, Jackson will have been converted to their use. It will have been evident to him from watching their use that they are an improvement on the machine he is still using.

In my opinion, intelligent diplomacy is better in every case than direct action, and in the long run, the mental wear and tear is less. But of course it requires a more educated and enlightened executive to apply it, than it does to apply direct action. —ARTHUR BRAMWELL, *Potter & Johnston Machine Company.*

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Why Conferences Anyway?

OUR present types of line and staff organization were not achieved over night; they are the product of a long period of evolution which has developed the present highly specialized forms from the simpler ones of a century ago. Such organizations require the re-delegation of authority to specially trained groups. The popularity of such methods seems to prove that they have been successful.

It is evident that committees are appointed, and conferences called, with the express purpose of dealing with specific problems the nature of which lead the appointing authority to believe that they may be handled by certain

discussion is not limited to foremen. Letters accepted and published will be paid for

parties whose occupations and training enable them to determine best the correct solution of the problem at hand.

With this in mind, it appears that the meetings of the committees, or the conferences, are expected to be carried out in order that the appointing authority may have the means of determining the personal views of those present, and to provide a way of welding these ideas into certain concrete conclusions, which will enable him to arrive at a particular solution to each problem. Thus, a shifting of responsibility is actually the thing which is reduced to a minimum.

It is true that conferences often lead to no definite conclusions, and promiscuous appointment often leads to improperly divided responsibility, but such conditions are generally the fault of the appointing authority and not of those who attend the meetings.

—J. R. FREYERMUTH, *Minneapolis-Honeywell Regulator Company.*

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No Verbal Orders Accepted

IT IS probable that there will always be customers without a full realization of the need for exact information regarding measurements for the parts they are in need of.

When the customer is present we can usually make a free-hand sketch and write in all the necessary dimensions in his presence, as well as outline the form. When the information is given by telephone we can write it down and afterward repeat back our understanding of figures and instructions. Each of these procedures will require tact in some cases to retain the confidence and good-will of the customer while we are trying to draw from him just what he means in the way of accuracy when he states a certain dimension. For instance, an inch hole may mean anywhere from $\frac{15}{16}$ in. to $1\frac{1}{16}$ in., or it may mean a close running or possibly a driving fit for a 1-in. shaft that will not vary more than 0.001 inch.

Our greatest risk of mistake, however, is in cases where the information goes through two or more hands before reaching the man who will actually do the work.

I feel that there is no good reason why anyone in the shop should fail to get written orders from the customer when possible, and no valid excuse for anyone to pass verbal instructions regarding dimensions on to another.

—JOHN MARK MAY.

*

Mottoes in the Shop

MOTTOES make some people think! Of course, there are in every shop some who will think without this kind of suggestion, but they are rare. Such men usually recognize that they are above the average of those to whom the mottoes are addressed.

We do not expect every motto to appeal to every man. The writer believes he is not below average intelligence, and his experience is that many of these sayings express truths that are self-evident. But every now and then one is couched in such unusual and effective language that it sticks; it makes a lasting impression. This is always something so self-evident you cannot help admitting its truth at once, but it puts an old thought in a new light, gives you a new angle on something you've been in the habit of saying, or doing, or omitting, thoughtlessly, and shows you how it looks to the other fellow. At least, that has been the writer's experience, and it would appear that anyone who has not had that experience after reading a number of them either is perfect or is impervious to impressions.

—J. MALVERN BENJAMIN, *Consulting Engineer.*

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Government Work

THE foreman who attempts to reduce the problem of "government work" to a set of rules is just building up trouble for himself. It is just one of those things which cannot be successfully prohibited nor yet allowed to develop wildly.

To shut one's eyes to reasonable "government jobs" is evading responsibility. The first move in proper control is to insist on the men obtaining permission, and to be reasonable in granting it. If the job only takes a few minutes, and involves work that will save considerable expense and trouble if commercial replacement or repair were undertaken instead, it should be allowed. If it is work the commercial counterpart of which can be obtained in a five and ten cent store, it should be refused, with a proper explanation of the unreasonableness of the request. In no instance should "government work" be allowed to develop into a habit, nor should a man be permitted to do "government work" for other people.

—ELI SMITH, *Engineer, Russell Company.*

*

Foremen and the Wage Bonus

THE foreman is right who, in his turn to speak, recognizes the workmen's viewpoint that their own increased efforts earned the bonus and that it should not be shared by the salaried foreman. Al is right about a separately considered premium for the foreman. Sharing a portion of the profits is not a mere bid for greater loyalty.

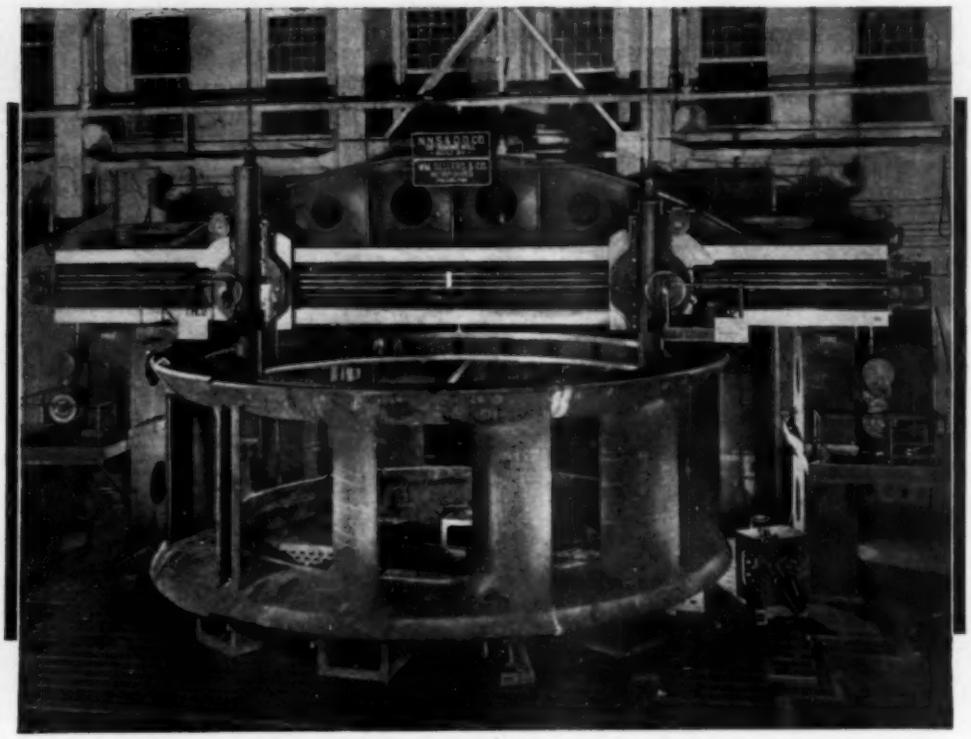
The factor of the wage bonus is direct production, the incentive to increased output and lower unit cost, applying to the workman individually, or in a group: in fact, "group incentive" is a term applied to a newer form of wage bonus payment based on studies covering all elements of planned production, including service within the group, the pay of crane man, maintenance man, etc., passing into the direct labor cost of the unit of product. This device holds many of the good points of the straight piecework system without the bad points.

—WALTER F. GILCREAS, *Cost Accountant.*

* * * *

THE · NEXT · TOPIC

"Honest Graft"



Boring mill set-up with two sections of uprights for machining a hydraulic speed ring

A Boring Mill of UNLIMITED CAPACITY

A floor-type mill with independent upper and lower sections introduces changed methods of machining

THE manufacture of water turbines is one of the post-war activities inaugurated by the Newport News Shipbuilding & Dry Dock Company, of Newport News, Va. This company was a successful bidder on the Muscle Shoals project and installed four large units that earned a substantial monetary premium for efficiency. The waterwheels furnished were, at that time, the largest ever made, but the increasing efficiency secured in low-head installations at Muscle Shoals begot a demand for still larger units.

When the turbines for the Conowingo project on the Susquehanna River were designed, they were so large that they would have taxed the capacity of the largest boring mill at Newport News, and would have tied it up so long as to interfere with other equally important work. It was decided, therefore, that if the company were the successful bidder it would be necessary to purchase another large boring mill.

Inasmuch as the possible expenditure for the machine itself, the pile supported foundations, and the necessary auxiliaries would cost considerably more than $100,000, there were problems to be solved by both the engineering and shop departments before executive approval would be given to the recommendation of the Plant Engineer who, under the scheme of management, is primarily responsible for all plant equipment. Among the questions that demanded an answer were: Under what conditions could such an expenditure be justified? How much of an increase might be expected in the size of waterwheel units on future orders? How could a boring mill large enough for possible future orders be profitably employed on smaller work when there was no large work?

While the foregoing were largely engineering and executive problems, the shop was vitally interested because there was no room for another large mill in the main machine shop, and it would have to be located in the turbine assembly department under the two largest cranes, occupying important assembly space.

Locating it in another shop also introduced handling problems that would be serious in the case of the parts of a waterwheel. Because of its shape, the hydraulic

runner is probably the most difficult piece of apparatus to handle in industry: when it is small it is fragile and the vanes break easily; when it is 20 feet in diameter and weighs 120 tons, turning it over is a man-sized job, requiring plenty of room. The same is true, but in a lesser degree, of the speed ring and the crown plate which are both much larger in diameter, but do not weigh so much.

These various problems finally crystallized into the following conclusions. The boring mill must be large enough to accommodate any future development in hydraulic turbines. It must be rigid enough to machine much smaller parts when necessary. It must be so arranged that the floor space it occupied could be utilized in an emergency, and finally, moving of turbine parts must be reduced to the vanishing point.

THE solution of each of the first three problems led to the same conclusion: The boring mill would have to be of the turntable type having the table flush with the floor plates, and the columns and rail would have to be designed as a self-contained unit that could be set up anywhere on the floor plates, or be removed altogether. This same type of boring mill would allow of portable machines and fixtures being moved to the work instead of moving the work about to the different machines, thus establishing an entirely new technique, appropriate and adaptable to very large work.

For reasons with which the shop was not concerned, the company did not receive the Conowingo waterwheel contract, and all the planning went for naught.

Good planning is seldom wasted, however, and when Colonel H. L. Cooper, who engineered the Keokuk power dam in the Mississippi River, and the Muscle Shoals job, went to Russia to install a still larger project on the Dnieper River, Newport News received the water-turbine work on the strength of their work at Muscle Shoals. The power units on this installation are the largest, physically, ever manufactured, so the previous plan for the boring mill was resurrected; the passage of time had but corroborated the decisions arrived at. Planning then passed from the abstract to the concrete, and, inasmuch as it was necessary to plan for a 200-ton table load plus a machine weight of 275 tons, the foundations, which were over the filled-in bed of a former creek, required close study.

This foundation, as finally installed, is erected on piling, and the installation is noteworthy in that the boring mill itself and the surrounding floor plates are carried on adjustable wedges with means for easy adjustment. The next feature is the planned accessibility of the foundations that afford not only access, but an abundance of room underneath the machine, so that its maintenance and inspection are not tasks, but routine matters. The stairways shown are guarded by pipe railings, and all moving parts are fully shielded. Brilliant illumination that eliminates the necessity of extension lamps is provided for by fixed lights.

The boring and turning mill was built by William Sellers and Company, Incorporated, of Philadelphia, Pa., and, while it is officially a 35-ft. mill, its capacity is limited only by the sides of the building.

The table itself is 19 ft. 10 in. in diameter, but the construction is such that the machine may be made infinitely adjustable in capacity both as to height and diameter. The table is set flush with the surface plate floor of the shop, or, to be exact, it is $\frac{1}{4}$ in. above the

Mill during construction. Note solid abutments on rail. Table is 19 ft. in diameter, level with floor.

floor, and if rings larger than the table are to be machined, outriggers can be used. For still larger inside turning jobs, the work can be clamped to the floor, one or more tool carriages bolted to the table, and the rail and uprights removed entirely. For outside turning, the uprights and rail can be set up anywhere on the surface plate floor because the rail feed mechanism is entirely independent of the table. This arrangement results in an unusually flexible machine.

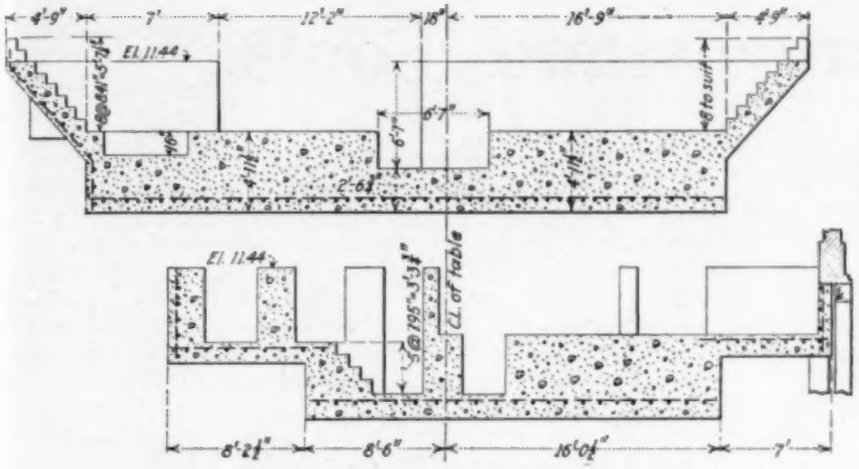
The bed, table, and driving mechanism are similar to those found on standard boring and turning mills. The table is supported on two flat annular bearings on the bed. A taper spindle 3 ft. long and 20 in. in diameter extends down into the bed and fits a bushing which is adjustable vertically to compensate for wear.

THE table is driven by a 50-hp. d.c. motor of 400 to 1,600 r.p.m. A gear-train with four changes connects the motor to a spur gear of 16-ft. pitch diameter with a circular pitch of 3.770 in. All this mechanism is under the floor plates where it is protected from dust and dirt. The table pinion is supported on a vertical shaft by a ball thrust bearing.

The cross rail for this machine has a 48-in. face and measures 60 in. from front to back. Its length is 42 ft. The stiffening beam is held against integral abutments on the cross-rail. The wedges at the ends of the stiffening member are driven in tight, placing the member in tension, and counteracting any tendency to deflect downward.

The cross-rail is provided with two saddles each fitted with a steel ram of rectangular section reinforced with tubular construction on the front. The stroke of the ram is 10 ft. but the machine has been used with an 18-in. extension when the ram was fully extended.

The uprights that support the rail are made in sections. This does not permit of any vertical movement of the rail but holds it at a fixed height from the table,



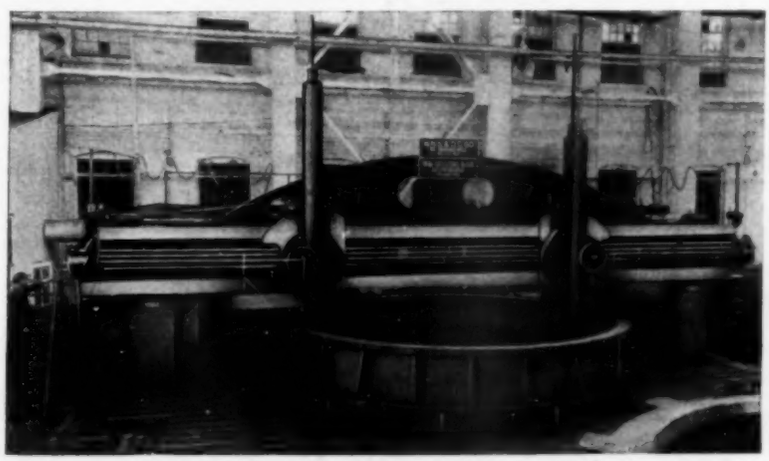
Sections of foundation, showing stairways and passages that give accessibility to the mill

depending upon the number of sections used. With a single section in use, the rail is 7 ft. above the table. Each additional section adds 6 ft. to the height. The controls are all operated from the level of the first section. Each section carries a platform and ladder.

The feed and traversing mechanisms are mounted on top of the rail. The feed mechanism is special in that it must have sufficient range to provide the correct amount of feed per revolution for a table speed of 30 to 1. The standard boring mill has the feed operating as a function of the table speed and is driven by a pinion meshing with the table gear, but as the cross-rail can have no connection with the table on this machine, the feed cannot be a function of the table speed and its mechanism must be independent and self-contained.

THE work shown on the boring mill in the first illustration is a speed ring for one of the four 77,500-kva. hydro-electric units being manufactured for the Dnieper River development. Each unit will weigh 1,760,000 lb. complete: the shaft and rotor will weigh 980,000 lb. and from these will be suspended, without other support, the runner, or waterwheel proper, weighing 280,000 lb., and its shaft, which is 40 in. diameter by 36 ft. long and weighs 136,000 lb. The shaft has a 70-in. flange which is bolted to a corresponding flange on the rotor shaft. The waterwheel, or runner, must be balanced so that a few pounds will tip it when it is resting on a ball center, and it must run true without a lower bearing. It was for such accurate work that the boring mill was built.

Mill with one section of uprights. In this condition it has 7-ft. clearance



Photographs by courtesy of William Sellers & Company, Inc.

A floor-type boring mill such as this has other advantages besides flexibility. When the parts to be machined reach a given size, the risk involved in moving them from one machine to another is not justified, and the interruption, rigging, and set-up charges are costly In some instances it is necessary to disassemble the parts, and reassemble them after moving.

The floor mill eliminates all this by allowing practically every operation to be done at one setting, using portable tools. A portable slotter or miller, for instance, will finish the feet of a large generator frame, and cut the keyways for the pole pieces. A portable drill or the same milling machine will drill holes both inside and outside. The frame can be stationary for inside drilling, or can revolve with the table for outside drilling. The table may be graduated in any desired number of divisions and used for indexing purposes. It should also be remembered that portable machines take up much less room than permanent ones, and that, in some instances, two or more operations may be carried on simultaneously.

Keeping a Line on Tools—*Discussion*

By W. R. Needham
Engineer, Design Department,
English Electric Company, Limited

MR. FAULHABER'S note on page 840, Vol. 71, of the *American Machinist,* is a principle capable of expansion in a number of ways and should not be overlooked. Not only is it important to retain a record of the maker of a machine and similar information, but also of performance results, improvements in design and operation, notable features, and the like. This record should come in handy when the time comes to purchase new equipment.

The wide-awake foreman should never neglect the collection of practical and worthwhile data respecting machine tools, processes, and similar information for his department. Indeed, this aspect of the work might well be left to an engineer not interested in the press of normal work and so, liable to neglect this important phase of shop management.

Tolerances and Tools

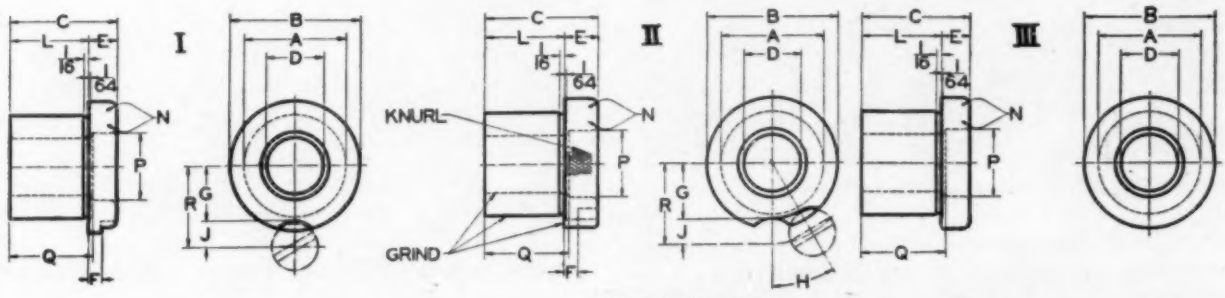
WHILE it is not intended to treat on the General Motors standard drill in this article, the drill had its part in the establishing of bushing diameters for reamers to produce standard holes. It is the general practice of drill manufacturers to produce drills with the maximum body diameter at basic, minus a working tolerance for the minimum diameter. General Motors also adopted this plan for its drill standard, which suggested that the minimum inside diameter of the drill bushing be basic, plus a working tolerance for the maximum diameter. Reamer bushings were established on the same basis, making it unnecessary to have two classes of bushings to take care of drill and reamer requirements.

With the minimum diameter of the bushing established at the maximum diameter of the reamer, the standardization program has been perfected to the point where new drills, reamers, and bushings taken from stock can immediately go to work on the job. All drills, reamers, and bushings are carefully inspected before going into stock, and the usual fitting or lapping, necessary where no definite standard working tolerance prevails, has been eliminated.

It was quite necessary that standard gages be adopted to complete our circle of cylindrical hole tolerances and

DRILL JIG BUSHINGS

Plain Renewable Type



General Dimensions

I Range	Outside Dia. A		Head Dia.	Overall Length C			Head Thick	Shelf Thick.	Shelf Loc.	Rad.	Length Under Head L			Rad.	*'C' bore		Screw Loc.
	Min	Max.	B	Standard	Short	Long	E	F	G	J	Standard	Short	Long	N	P	Q	R
From .0520 to .1562, Incl.	.3124	.3126	3 5/64	2 3/32	1 5/32	3 1/32	1/4	1/8	1 11/64	21/64	1 5/32	7/32	2 3/32	1/16	3/16	1/2	1/2
Above .1562 to .3125, Incl.	.4999	.5001	4 7/64	2 7/32	1 9/32	1 5/32	1/4	1/8	1 7/64	21/64	1 9/32	1 1/32	2 5/32	1/16	**	5/8	1 9/32
Above .3125 to .5000, Incl.	.7499	.7501	6 3/64	1 1/32	2 3/32	1 11/32	1/4	1/8	2 5/64	21/64	2 5/32	1 5/32	1 3/32	1/16	—	—	2 3/32
Above .5000 to .7500, Incl.	.9999	1.0001	1 2 3/64	1 1/4	1 5/16	1 5/8	3/8	3/16	9/16	21/64	7/8	9/16	1 1/4	1/16	—	—	3 7/64
Above .7500 to 1.0000, Incl.	1.3749	1.3751	1 4 7/64	1 7/16	1 1/16	1 13/16	3/8	3/16	3/4	21/64	1 1/16	1 1/16	1 7/16	3/32	—	—	1 5/64
Above 1.0000 to 1.3750, Incl.	1.7499	1.7501	2 1 5/64	1 5/8	1 1/4	2	3/8	3/16	31/32	25/64	1 1/4	7/8	1 5/8	3/32	—	—	1 2 3/64
Above 1.3750 to 1.7500, Incl.	2.2499	2.2501	2 4 7/64	1 13/16	1 7/16	2 1/4	3/8	3/16	1 7/32	25/64	1 7/16	1 1/16	1 7/8	3/32	—	—	1 3 3/64

General Dimensions

II Range	Outside Dia. A		Head Dia.	Overall Length C			Head Thk.	Shelf Thk.	Shelf Loc.	Angle	Rad.	Length Under Head L			Rad.	*'C' bore		Screw Loc.
	Min.	Max.	B	Standard	Short	Long	E	F	G	H	J	Standard	Short	Long	N	P	Q	R
From .0520 to .1562, Incl.	.3123	.3125	3 5/64	2 3/32	1 5/32	1 3/32	3/8	1/8	1 11/64	65°	21/64	1 5/32	7/32	2 3/32	1/16	3/16	1/2	1/2
Above .1562 to .3125, Incl.	.4998	.5000	4 7/64	1 9/32	2 5/32	1 1/32	7/16	1/8	1 7/64	65°	21/64	1 9/32	1 1/32	2 5/32	1/16	**	5/8	1 9/32
Above .3125 to .5000, Incl.	.7498	.7500	6 3/64	1 7/32	2 5/32	1 1/32	7/16	1/8	2 5/64	50°	21/64	2 5/32	1 5/32	1 3/32	1/16	—	—	2 3/32
Above .5000 to .7500, Incl.	.9998	1.0000	1 2 3/64	1 5/16	1	1 1/16	7/16	3/16	9/16	35°	21/64	7/8	9/16	1 1/4	1/16	—	—	3 7/64
Above .7500 to 1.0000, Incl.	1.3748	1.3750	1 4 7/64	1 1/2	1 1/8	1 7/8	7/16	3/16	3/4	30°	21/64	1 1/16	1 1/16	1 7/16	3/32	—	—	1 5/64
Above 1.0000 to 1.3750, Incl.	1.7498	1.7500	2 1 5/64	1 7/8	1 1/2	2 1/4	3/8	3/16	31/32	30°	25/64	1 1/4	7/8	1 5/8	3/32	—	—	1 2 3/64
Above 1.3750 to 1.7500, Incl.	2.2498	2.2500	2 4 7/64	2 1/16	1 11/16	2 1/2	3/8	3/16	1 7/32	25°	25/64	1 7/16	1 1/16	1 7/8	3/32	—	—	1 3 3/64

General Dimensions

III Range	†Outside Dia. A		Head Dia.	Overall Length C			Head Thick.	Length Under Head L			Rad.
	Min.	Max.	B	Standard	Short	Long	E	Standard	Short	Long	N
From .0520 to .1562, Incl.	.3290	.3295	3 5/64	2 3/32	1 5/32	3 1/32	1/4	1 5/32	7/32	2 3/32	1/16
Above .1562 to .3125, Incl.	.5165	.5170	4 7/64	2 7/32	1 9/32	1 5/32	1/4	1 9/32	1 1/32	2 5/32	1/16
Above .3125 to .5000, Incl.	.7665	.7670	6 3/64	1 1/32	2 3/32	1 11/32	1/4	2 5/32	1 5/32	1 3/32	1/16
Above .5000 to .7500, Incl.	1.0170	1.0175	1 2 3/64	1 1/4	1 5/16	1 5/8	3/8	7/8	9/16	1 1/4	1/16
Above .7500 to 1.0000, Incl.	1.3920	1.3930	1 4 7/64	1 7/16	1 1/16	1 13/16	3/8	1 1/16	1 1/16	1 7/16	3/32
Above 1.0000 to 1.3750, Incl.	1.7675	1.7685	2 1 5/64	1 5/8	1 1/4	2	3/8	1 1/4	7/8	1 5/8	3/32
Above 1.3750 to 1.7500, Incl.	2.2675	2.2685	2 4 7/64	1 13/16	1 7/16	2 1/4	3/8	1 7/16	1 1/16	1 7/8	3/32

† This dimension allows for fitting.

* Bushings 7/32 and larger and the short, or "X" length, bushings are not counterbored.

**1/32 larger than drill size "D."

By D. W. OVAITT

Chairman, Tool Standards Sub-Committee
Buick Motor Company

The preceding number of *American Machinist* describes tolerances adopted by General Motors for holes and reamers. The present article has to do with jig bushings and plug gages.

A standard, to be effective, must have as its basis such practical considerations as reamer size and life. General Motors shop executives found that established hole tolerances were not suited to their needs and accordingly set about determining their own limits. The resulting standard shows considerable variation from that sponsored by the American Standards Association. Comments by qualified judges on the relative merits of the two systems will be welcomed.

DRILL JIG BUSHINGS

Size		Inside Dia. D	
No.	Dec.	Min.	Max.
55	.0520	.0520	.0523
54	.0550	.0550	.0553
53	.0595	.0595	.0598
52	.0635	.0635	.0638
51	.0670	.0670	.0673
50	.0700	.0700	.0703
49	.0730	.0730	.0733
48	.0760	.0760	.0763
47	.0785	.0785	.0788
46	.0810	.0810	.0813
45	.0820	.0820	.0823
44	.0860	.0860	.0863
43	.0890	.0890	.0893
42	.0935	.0935	.0938
41	.0960	.0960	.0963
40	.0980	.0980	.0983
39	.0995	.0995	.0998
38	.1015	.1015	.1018
37	.1040	.1040	.1043
36	.1065	.1065	.1068
35	.1100	.1100	.1103
34	.1110	.1110	.1113
33	.1130	.1130	.1133
32	.1160	.1160	.1163
31	.1200	.1200	.1203
30	.1285	.1285	.1288
29	.1360	.1360	.1363
28	.1405	.1405	.1408
27	.1440	.1440	.1443
26	.1470	.1470	.1473
25	.1495	.1495	.1498
24	.1520	.1520	.1523
23	.1540	.1540	.1543
22	.1570	.1570	.1573
21	.1590	.1590	.1593
20	.1610	.1610	.1613
19	.1660	.1660	.1663
18	.1695	.1695	.1698
17	.1730	.1730	.1733

Size		Inside Dia. D	
No.	Dec.	Min.	Max.
16	.1770	.1770	.1773
15	.1800	.1800	.1803
14	.1820	.1820	.1823
13	.1850	.1850	.1853
12	.1890	.1890	.1893
11	.1910	.1910	.1913
10	.1935	.1935	.1938
9	.1960	.1960	.1963
8	.1990	.1990	.1993
7	.2010	.2010	.2013
6	.2040	.2040	.2043
5	.2055	.2055	.2058
4	.2090	.2090	.2093
3	.2130	.2130	.2133
2	.2210	.2210	.2213
1	.2280	.2280	.2283
A	.2340	.2340	.2343
B	.2380	.2380	.2383
C	.2420	.2420	.2423
D	.2460	.2460	.2463
E(¼)	.2500	.2500	.2503
F	.2570	.2570	.2573
G	.2610	.2610	.2613
H	.2660	.2660	.2663
I	.2720	.2720	.2723
J	.2770	.2770	.2773
K	.2810	.2810	.2813
L	.2900	.2900	.2903
M	.2950	.2950	.2953
N	.3020	.3020	.3023
O	.3160	.3160	.3163
P	.3230	.3230	.3233
Q	.3320	.3320	.3323
R	.3390	.3390	.3393
S	.3480	.3480	.3483
T	.3580	.3580	.3583
U	.3680	.3680	.3683
V	.3770	.3770	.3773
W	.3860	.3860	.3863
X	.3970	.3970	.3973

DRILL JIG BUSHINGS

Size		Inside Dia. D	
Frac.	Dec.	Min.	Max.
1/16	.0625	.0625	.0628
5/64	.0781	.0781	.0784
3/32	.0937	.0937	.0940
7/64	.1094	.1094	.1097
1/8	.1250	.1250	.1253
9/64	.1406	.1406	.1409
5/32	.1562	.1562	.1565
11/64	.1719	.1719	.1722
9/16	.1875	.1875	.1878
13/64	.2031	.2031	.2034
7/32	.2187	.2187	.2190
15/64	.2344	.2344	.2347
1/4 (E)	.2500	.2500	.2503
17/64	.2656	.2656	.2659
9/32	.2812	.2812	.2815
19/64	.2969	.2969	.2972
5/16	.3125	.3125	.3128
21/64	.3281	.3281	.3284
11/32	.3437	.3437	.3440
23/64	.3594	.3594	.3597
3/8	.3750	.3750	.3753
25/64	.3906	.3906	.3909
13/32	.4062	.4062	.4065
27/64	.4219	.4219	.4222
7/16	.4375	.4375	.4378
29/64	.4531	.4531	.4534
15/32	.4687	.4587	.4690
31/64	.4844	.4844	.4847
1/2	.5000	.5000	.5003

Size		Inside Dia. D	
Frac.	Dec.	Min.	Max.
33/64	.5156	.5156	.5159
17/32	.5312	.5312	.5315
35/64	.5469	.5469	.5472
9/16	.5625	.5625	.5628
37/64	.5781	.5781	.5784
19/32	.5937	.5937	.5940
39/64	.6094	.6094	.6097
5/8	.6250	.6250	.6253
41/64	.6406	.6406	.6409
21/32	.6562	.6562	.6565
43/64	.6719	.6719	.6722
11/16	.6875	.6875	.6878
45/64	.7031	.7031	.7034
23/32	.7187	.7187	.7190
47/64	.7344	.7344	.7347
3/4	.7500	.7500	.7503
49/64	.7656	.7656	.7659
25/32	.7812	.7812	.7815
51/64	.7969	.7969	.7972
13/16	.8125	.8125	.8128
53/64	.8281	.8281	.8284
27/32	.8437	.8437	.8440
55/64	.8594	.8594	.8597
7/8	.8750	.8750	.8753
57/64	.8906	.8906	.8909
29/32	.9062	.9062	.9065
59/64	.9219	.9219	.9222
15/16	.9375	.9375	.9378
61/64	.9531	.9531	.9534
31/32	.9687	.9687	.9690
63/64	.9844	.9844	.9847
1	1.0000	1.0000	1.0003

Size		Inside Dia. D	
Frac.	Dec.	Min.	Max.
1 1/64	1.0156	1.0156	1.0159
1 1/32	1.0312	1.0312	1.0315
1 3/64	1.0469	1.0469	1.0472
1 1/16	1.0625	1.0625	1.0628
1 5/64	1.0781	1.0781	1.0784
1 3/32	1.0937	1.0937	1.0940
1 7/64	1.1094	1.1094	1.1097
1 1/8	1.1250	1.1250	1.1253
1 9/64	1.1406	1.1406	1.1409
1 5/32	1.1562	1.1562	1.1565
1 11/64	1.1719	1.1719	1.1722
1 3/16	1.1875	1.1875	1.1878
1 13/64	1.2031	1.2031	1.2034
1 7/32	1.2187	1.2187	1.2190
1 15/64	1.2344	1.2344	1.2347
1 1/4	1.2500	1.2500	1.2503
1 17/64	1.2656	1.2656	1.2659
1 9/32	1.2812	1.2812	1.2815
1 19/64	1.2969	1.2969	1.2972
1 5/16	1.3125	1.3125	1.3128
1 21/64	1.3281	1.3281	1.3284
1 11/32	1.3437	1.3437	1.3440
1 23/64	1.3594	1.3594	1.3597
1 3/8	1.3750	1.3750	1.3753
1 25/64	1.3906	1.3906	1.3909
1 13/32	1.4062	1.4062	1.4065
1 27/64	1.4219	1.4219	1.4222
1 7/16	1.4375	1.4375	1.4378
1 29/64	1.4531	1.4531	1.4534
1 15/32	1.4687	1.4687	1.4690
1 31/64	1.4844	1.4844	1.4847
1 1/2	1.5000	1.5000	1.5003

GENERAL SPECIFICATIONS

1. Inside Diameter—D
Plus .0003, minus .0000.

2. Outside Diameter—A
Press Fit Bushings
See item 16.
Plain Bushings — Plus or minus .0001.
Slip Bushings — +.0000—.0002.

3. Head Diameter—B
Plus or minus 1/64.

4. Overall Length—C
Plus or minus 1/64.

5. Head Thickness—E
Plus or minus 1/32.

6. Screw Shelf Thickness—F
Plus .000, minus .010.

7 Concentricity
.0002 indicator reading

8. Material
Tool steel

9. Hardness
Hole to be file hard. Outside of bushing must be not more than 66 Rockwell or 90 Sclerscope

10. Finish
All essential surfaces may be ground or ground and lapped according to manufacturer's practice, it being understood that where grinding alone is done the finished surface must be acceptable to user

11. Decimal Sizes
The eight sizes not covered by number, letter, or fraction are standard tap drill bushings as follows:
.0720, for #2-64
.0906, for #4-40
.1378, for #8-36
.2165, for 1/4-28
.5062, for 9/16-18
.5687, for 5/8-18
.8024, for 7/8-14
.9274, for 1-14

12. Liner Bushings
Liner bushings are intended for use with plain and slip bushings.

13. Lock Screws
Lock screws are necessary only with plain and slip bushings though milling for screw head may be found on press fit type.

14. Counterbore—P and Q
Bushings 3/32 and larger and the short, or "x" length, bushings are not counterbored.

15. Marking and Manufacture
Size and manufacturer's name or trade mark to be marked on head. Standard length bushings to be marked "L," short length bushings to be marked "X", and long length bushings to be marked "O" All burrs must be removed.

16. Note
Press fit bushings have an outside diameter of 1/64 over nominal plus a press fit allowance. This provides ample stock for grinding and also allows for fitting directly into a hole made with a 1/64 oversize reamer.

reamers. The blanks and handles are of the design worked up by the American Gage Design Committee under the auspices of N.S.T.C. A series of seven gages are required to gage all six classes of tolerances—one "not go" for the maximum hole in all classes, and six "go" gages to measure minimum holes in all classes. The standard hole in any class provides the tolerance to which the hole may be manufactured. Our intention is that the full tolerance shown in any class be the law and that the shop may work to the full limit. To that end, we originally intended to put a plus tolerance on a "not go" gage but compromised on a split tolerance until such time as the matter is definitely settled.

It is quite necessary that allowance be made for wear on the "go" gage. A "go" gage must enter a hole and a "not go" gage should not, in order that the hole be deemed within the limits prescribed. A "go" gage having a plus dimension to provide for working tolerance

PLAIN CYLINDRICAL PLUG GAGING MEMBERS-

Taper Lock Design, Range Above .240 to 2.510, Inclusive

Diameters

Size	Go												Not Go	
	Class 6		Class 5		Class 4		Class 3		Class 2		Class 1		All Classes	
	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.
¼	.2500	.2501	.2495	.24965	.2490	.24915	.2485	.24865	.2475	.2477	.2465	.2468	.25045	.25055
9/32	.2812	.2813	.2807	.28085	.2802	.28035	.2797	.27985	.2787	.2789	.2777	.2780	.28165	.28175
5/16	.3125	.3126	.3120	.31215	.3115	.31165	.3110	.31115	.3100	.3102	.3090	.3093	.31295	.31305
11/32	.3437	.3438	.3432	.34335	.3427	.34285	.3422	.34235	.3412	.3414	.3402	.3405	.34415	.34425
⅜	.3750	.3751	.3745	.37465	.3740	.37415	.3735	.37365	.3725	.3727	.3715	.3718	.37545	.37555
13/32	.4062	.4063	.4057	.40585	.4052	.40535	.4047	.40485	.4037	.4039	.4027	.4030	.40665	.40675
7/16	.4375	.4376	.4370	.43715	.4365	.43665	.4360	.43615	.4350	.4352	.4340	.4343	.43795	.43805
15/32	.4687	.4688	.4682	.46835	.4677	.46785	.4672	.46735	.4662	.4664	.4652	.4655	.46915	.46925
½	.5000	.5001	.4995	.49965	.4990	.49915	.4985	.49865	.4975	.4977	.4965	.4968	.50045	.50055
9/16	.5625	.5626	.5620	.56215	.5615	.56165	.5610	.56115	.5600	.5602	.5590	.5593	.56295	.56305
⅝	.6250	.6251	.6245	.62465	.6240	.62415	.6235	.62365	.6225	.6227	.6215	.6218	.62545	.62555
11/16	.6875	.6876	.6870	.68715	.6865	.68665	.6860	.68615	.6850	.6852	.6840	.6843	.68795	.68805
¾	.7500	.7501	.7495	.74965	.7490	.74915	.7485	.74865	.7475	.7477	.7465	.7468	.75045	.75055
13/16	.8125	.8126	.8120	.81215	.8115	.81165	.8110	.81115	.8100	.8102	.8090	.8093	.81295	.81305
⅞	.8750	.8751	.8745	.87465	.8740	.87415	.8735	.87365	.8725	.8727	.8715	.8718	.87545	.87555
15/16	.9375	.9376	.9370	.93715	.9365	.93665	.9360	.93615	.9350	.9352	.9340	.9343	.93795	.93805
1	1.0000	1.0001	.9995	.99965	.9990	.99915	.9985	.99865	.9975	.9977	.9965	.9968	1.00045	1.00055
—														
1 1/16	1.0625	1.0626	1.0620	1.06215	1.0615	1.06165	1.0610	1.06115	1.0600	1.0602	1.0590	1.0593	1.06295	1.06305
1⅛	1.1250	1.1251	1.1245	1.12465	1.1240	1.12415	1.1235	1.12365	1.1225	1.1227	1.1215	1.1218	1.12545	1.12555
1 3/16	1.1875	1.1876	1.1870	1.18715	1.1865	1.18665	1.1860	1.18615	1.1850	1.1852	1.1840	1.1843	1.18795	1.18805
1¼	1.2500	1.2501	1.2495	1.24965	1.2490	1.24915	1.2485	1.24865	1.2475	1.2477	1.2465	1.2468	1.25045	1.25055
1⅜	1.3750	1.3751	1.3745	1.37465	1.3740	1.37415	1.3735	1.37365	1.3725	1.3727	1.3715	1.3718	1.37545	1.37555
1½	1.5000	1.5001	1.4995	1.49965	1.4990	1.49915	1.4985	1.49865	1.4975	1.4977	1.4965	1.4968	1.50045	1.50055
1⅝	1.6250	1.6251	1.6245	1.62465	1.6240	1.62415	1.6235	1.62365	1.6225	1.6227	1.6215	1.6218	1.62545	1.62555
1¾	1.7500	1.7501	1.7495	1.74965	1.7490	1.74915	1.7485	1.74865	1.7475	1.7477	1.7465	1.7468	1.75045	1.75055
1⅞	1.8750	1.8751	1.8745	1.87465	1.8740	1.87415	1.8735	1.87365	1.8725	1.8727	1.8715	1.8718	1.87545	1.87555
2	2.0000	2.0001	1.9995	1.99965	1.9990	1.99915	1.9985	1.99865	1.9975	1.9977	1.9965	1.9968	2.00045	2.00055
2⅛	2.1250	2.1251	2.1245	2.12465	2.1240	2.12415	2.1235	2.12365	2.1225	2.1227	2.1215	2.1218	2.12545	2.12555
2¼	2.2500	2.2501	2.2495	2.24965	2.2490	2.24915	2.2485	2.24865	2.2475	2.2477	2.2465	2.2468	2.25045	2.25055
2⅜	2.3750	2.3751	2.3745	2.37465	2.3740	2.37415	2.3735	2.37365	2.3725	2.3727	2.3715	2.3718	2.37545	2.37555
2½	2.5000	2.5001	2.4995	2.49965	2.4990	2.49915	2.4985	2.49865	2.4975	2.4977	2.4965	2.4968	2.50045	2.50055

1. Material
Oil hardening steel, G. M. C. 45 M, or equivalent, hardened.

2. Rockwell Hardness

3. Tolerances
Gage manufacturer's tolerance is always considered as the maximum diameter, minus .0001 on the go gage, it being understood that the gage manufacturer will work to the high limit as much as possible.

4. Finish
All essential surfaces must be ground or ground and lapped according to manufacturer's practice, it being understood that where grinding alone is done the finished surface must be acceptable to user.

5. Marking and Manufacture
On finished gaging members the decimal size, (minimum for go members and mean for not go members) part number and manufacturer's name or trade mark is to be marked on end where size will permit. Marking otherwise to be placed on shank, size marking to be visible when gaging member is assembled in handle, for example, **.2500** for the go member, class **6**, and **.2505** for the not go member, both ¼ nominal diameter. All burrs must be removed. Blanks, when ordered, are to show manufacturer's name or trade mark only.

and wear, automatically takes away part of the working tolerance of the hole. A "not go" gage having a minus tolerance takes away more working limit. It is obvious that a hole just enough smaller than the "not go" gage, to prevent its entering under hand pressure, must be smaller than the gage. Therefore, the minimum "not go" gage should be the same as the high limit of the hole. The maximum diameter should be minimum, plus working tolerance.

Let us imagine a "not go" plug with 0.0002-in. plus working tolerance. The gage could measure 1.0007 in. or 0.0002 in. above the maximum hole tolerance. Suppose a new reamer had just been put on the job and the first run of holes were being checked with the 1.0007-in. gage which wouldn't quite enter. The fact that the "not go" wouldn't enter indicates that the holes were smaller than the gage but were very close to the high limit and, therefore, acceptable within the meaning of "passing inspection."

Now let's imagine a "not go" with a 1.0002-in. minus working tolerance. This gage could measure 1.0003 in. or 0.0002 in. under the maximum hole diameter. Such a gage may have entered the first run of holes produced with the new reamer and would have caused the pieces to have been rejected although the actual diameter of the holes would have been within the tolerance set up on the drawing.

These holes, to have "passed inspection," would have to have been smaller than the 1.0003-in. gage (shall we say 0.0001 or 0.0002 in.) or approximately 1.000 in. plus, in diameter. This would have deprived the shop of approximately an additional (the "go" gage has a plus tolerance) 0.0003-in. allowable working limit from the top side and scrapped valuable pieces of material. In order that the shop may have the full amount of allowable working tolerance, it is obvious that the "not go" gage should have a plus working tolerance. American Gage Design standards, to which have been applied General Motors tolerances for gaging members as shown in the accompanying tables, have been adopted.

· BOOK · REVIEWS ·

APPLIED MECHANICS. *Third Edition. By Alfred T. Poorman, professor of applied mechanics, Purdue University. Two-hundred ninety-seven 6x9-in. pages. Cloth board covers. Published by the McGraw-Hill Book Company, 370 Seventh Ave., New York, N. Y. Price $2.75.*

AFTER having studied the presentation of a scientific principle, the reader is often at a loss to know whether he properly understands the theory. If, however, there is presented a worked out example dealing with the application of the principle set forth, the student is able to check the correctness of his understanding and obtain the confidence resulting therefrom. In the presentation of the subject matter in this book, the author gives a worked out example immediately following the paragraph dealing with each of the separate theories or principles which he presents. This is probably the most valuable and undoubtedly the most outstanding feature of this book on applied mechanics.

Fundamental definitions, law, and the algebraic and graphic solutions of force diagrams are presented in the first chapters, followed by the solution for the more complicated systems of forces and moments acting on a body. There are also several chapters on friction, centroids, and moments of inertia included in the first part of the book. The principles of kinetics are presented in the second part and the presentation of the mechanics applying to many practical problems is given in this portion of the book. The subject matter includes the balancing of rotating bodies, kinetic reactions on connecting rods, balancing of reciprocating parts, and a chapter on impulse, momentum, and impact.

A great number of problems are found scattered throughout the book. The answers to these problems are given, enabling one to check the correctness of his solution.

*

THE SUCCESSFUL CONTROL OF PROFITS. *By Walter Rautenstrauch, Professor of Industrial Engineering at Columbia University. Published by B. C. Forbes Publishing Company, 120 Fifth Ave., New York, N. Y. Two hundred thirty-nine 5¼x8-in. pages. Indexed. Price $3.00*

RECENT books and articles on methods of obtaining accurate costs reflect a realization of the vital importance of this subject and a desire to know more about it. After the acquisition of an adequate cost system, the next important step is to obtain maximum utility from cost results. In demonstrating to the executive how to apply most effectively the tools which the modern accounting has placed at his disposal, Professor Rautenstranch has made a timely contribution to the subject of efficient management.

He approaches his topic from its broadest aspect—the analysis of the true meaning of profits and the conditions which make them possible. He exposes the basic economic principles controlling business success and failure, the real character of a business in relation to its costs, and in particular, the characteristics of manufacturing enterprises. The balance sheet, the profit and loss statement, and the budget are discussed, not as terms of accountancy but as accurate gages of business performance. The functions of the break-even chart are described in a manner which makes obvious the value of this graphic analysis.

In his last chapter, the author throws light on that phase of business which is constantly commanding greater attention—that of control of the future. While admitting the existence of many imponderables, he shows that phases of business, thought uncontrollable a few years ago, may be effectually influenced by the far-sighted executive.

Professor Rautenstrauch's work is well worth the attention of those responsible for business management. Its text is amply illustrated with 23 charts which clarify the author's exposition.

*

"MECHANICAL WORLD" ELECTRICAL POCKET BOOK, 1930. *Three hundred eighty-six pages, 4x6 in. Cardboard covers. Published by the "Mechanical World," 65 King Street, Manchester, England. Price $0.36.*

THIS book contains a collection of electrical engineering notes, rules, tables, and data covering a wide field of apparatus. The information is in a condensed form with all non-important material eliminated, which facilitates finding the desired information.

The various subjects have been rewritten and brought up to date, and as a whole, the volume is a desirable addition to the shelf of the engineer or electrician and to the library of the purchasing agent.

*

THE WELDING ENCYCLOPEDIA. *Seventh Edition. Compiled and edited by L. B. Mackenzie and H. S. Card. Five hundred forty 6x8¾-in. pages. Indexed. Six hundred seventy illustrations. Flexible imitation leather binding. Published by The Welding Engineer Publishing Company, 608 South Dearborn Street, Chicago, Ill. Price $5.00.*

AMONG the changes of importance in this edition are definitions, symbols, and nomenclature recommended as standard by the American Welding Society, and extensive discussions of the application of welding in the construction of steel structures, machinery and aircraft. Other alterations and additions are those which have been suggested by inquiries for information received by *The Welding Engineer*.

The book contains 200 pages of definitions and discussions of words and terms used in welding literature, including a complete list of trade names, trademarks, and brand names, together with the name of the producing company—something which is obtainable nowhere else. This section is followed by treatises on gas, arc, resistance, and thermit welding, including instructions for welding all the commercial metals by these processes. Separate chapters are devoted to important applications of welding such as pipe, tanks, boilers, and structural steel. The subject of cutting and that of training operators are also given separate treatments. The book is printed in rather small type and is consequently a little hard to read, but is one of the best of the few books obtainable in this increasingly important field.

What Is Normal Operation

IN THE MACHINE TOOL INDUSTRY?

By E. F. Du Brul

General Manager,
National Machine Tool Builders' Association

THE year 1929 stands out as the highest in volume of orders entered for the eleven years covered by our Index of Machine Tool Orders. The two boom years of 1928 and 1929 taken together average 259 points per month on our scale, whereas the two previous boom years of 1919 and 1920 averaged 232. The year 1929 averaged 20 points per month above 1919, and 1928 averaged 35 points per month above 1920.

Studying the behavior of this Index over a period of years shows great variations between different months, as well as between different years. The boom of 1919 and 1920 was sharp and short, with the biggest index, 417, in January, 1920. The biggest month of the recent boom was February, 1929, with 336. The maximum quarter of the old boom averaged 363, whereas the maximum quarter of 1929 averaged 321, a decidedly lower figure. But the 1919 and 1920 boom showed fourteen months above 200 on our scale, whereas in the 1928 and 1929 boom, twenty-two months were above 200. From these facts we can think of these last two years as those of the Big Boom, just as we think of 1921 and 1922 as the Big Slump.

It is also worthwhile to scrutinize the data on a basis of average monthly figures. Monthly average orders for the ten years from 1919 to 1928 measured 149 on our scale and the ten years from 1920 to 1929 averaged 151. If we take in the two boom years at the ends of the period, the eleven years averaged 161 per month. The seven lean years between the two booms average only 113, while the average of the four boom years was 245. So, to supply the average demand in these four boom years, the industry carried assets which averaged only 47 per cent operation for seven lean years.

That averages are deceptive is shown by the fact that March, 1929, showed a shipment record of 329, or about 330, the maximum three months' boom average of orders.

Apparently this figure is the extreme capacity of the industry in 1929. Shipments reached this level only under constant strain. Perhaps new machines and plant extensions have since increased this capacity. This high output was obtained only by overtime and double-shift operation, so it is not what we should consider a normal capacity, as a basis of managerial policies, pricing, or costs.

This figure of 330 is about one-fourth more than the average monthly demand of the last two boom years which averaged 259, and this top-notch production of one month was only about 15 per cent more than the average monthly demand, 281, of the whole year 1929.

In default of figures that indicate clearly what the normal one-shift capacity is, we estimate it at around 260 at this time. This figure may be high, as it assumes that only about 20 per cent of the known peak shipments were due to operation over one-shift capacity. Let us give capacity the worst of such over-estimate. We find that the average monthly demand for the last five years, including two boom years and three decidedly lower years that preceded, was 193. Therefore, if the one-shift capacity is now 260, we managed to get 74 per cent utilization during the last five years, with the extra cost effort involved at the end of 1928 and through 1929.

The ten years ending with 1929, averaging 151, gave an average utilization of about 57 per cent of the present capacity. If we think it fairer to eliminate both boom and depression years from 1919 through 1922, the last seven years demand averaged 171, which is a trifle less than 66 per cent of the above one-shift capacity.

These estimates come close to the experience of the few members who reported in 1922 that the utilization of their plants averaged around 65 per cent over 10 years.

It would be advisable to make a survey of the present one-shift capacity in order to get closer figures on utilization. This capacity figure is important because the fixed charges on capital invested in the plant surely should be taken on a basis of average utilization in order to establish a normal rate of overhead. It is only fair to stockholders of the machine tool industry for managers to use every means indicated by good judgment and economics to protect their interests.

We hope that we shall not again have such violent fluctuations as our large companies had when the group showed 444 in January, 1920, and only 23 in July, 1921, eighteen months later. But the same group had a sufficiently sharp drop in two months between October, 1929, when their orders were 337 and December, 1929, when they got down to 167. This extreme irregularity requires great care in figuring overhead in costs.

It would seem reasonable to aim for the same minimum rate of return on capital employed as set for General Motors by its president. On his basis we would aim to earn 15 per cent minimum on capital employed, valuing plant assets at present-day reproduction values. We would aim to earn this 15 per cent by normal operation at two-thirds of one-shift capacity. On this basis, the normal operation would show at 174 on our scale. On that basis the tools shipped in 1929 should have brought in well over 30 per cent on our capital.

But it is decidedly doubtful if the machine tool industry has done any such thing, for the Robert Morris report showed only 17 per cent earned by 24 good concerns on the book values of their assets in 1929. The present reproduction values are certainly well above the book values. So the rate on true values was well below the 13 per cent on book values. It is doubtful if the very active year of 1929 would show anything like 20 per cent on the true values of the capital which this industry has placed at the service of its customers.

An abstract of a discussion before the twenty-eighth spring convention of the National Machine Tool Builders' Association, in Columbus, Ohio, May 19.

IDEAS FROM PRACTICAL MEN

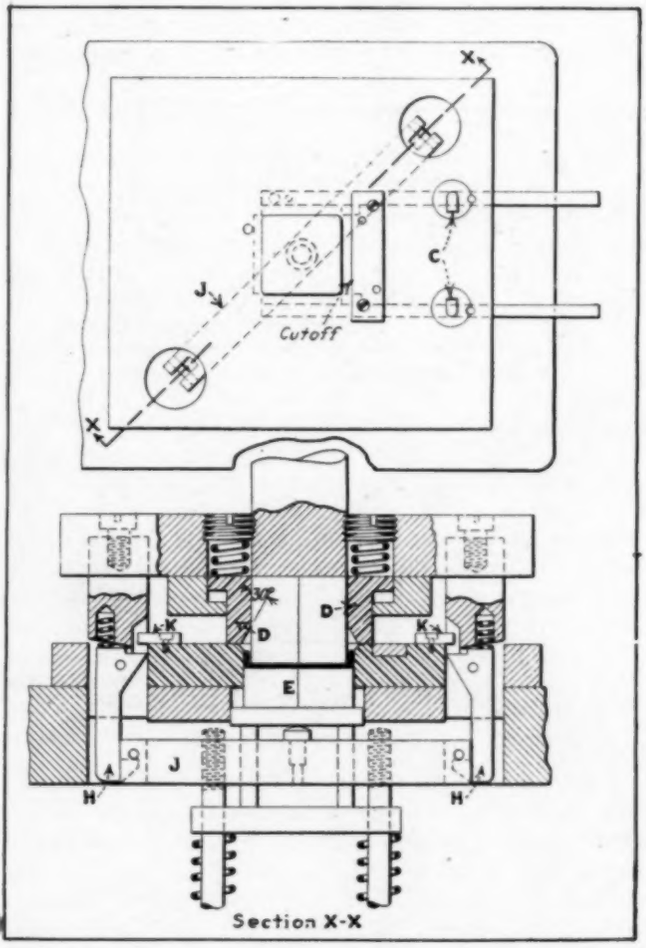
The department, "IDEAS FROM PRACTICAL MEN," is devoted to the exchange of information on methods useful to the machinery industries. Its scope includes all divisions of the metal-working industry, from drafting room to shipping platform. Descriptions of methods or devices that have proved their value are carefully considered, and those published are paid for. The rates are from a minimum of five dollars upwards, depending upon their merit.

Double-Acting Tools for a Press

BY C. W. HINMAN
Chief Tool Designer, Kobzy Tool Company

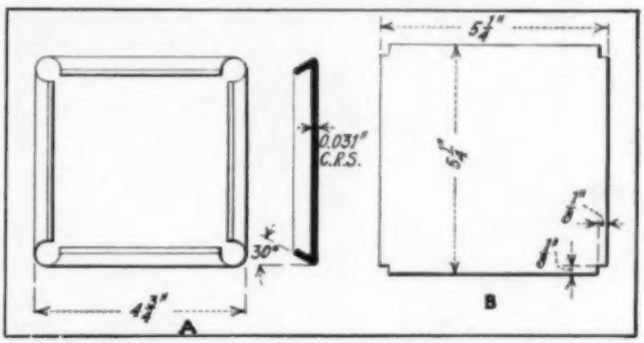
THE press tools shown in the illustration were designed for the production of such parts as the one shown at *A*. The blanks, indicated at *B*, are notched and cut off from sheet stock of the proper width. One of the features of these tools is that they do the notching, cutting off and the preliminary forming on the downward stroke of the ram, while the finish forming is done on the upward stroke.

In the first step, the notches are cut in the corners by the dies shown at *C*, so that the rounded, inner corners of the finished work will be brought to a height of ¼ inch. In the next step, the stock is cut off by the hollow punch *D*, through which the forming punch works. The forming punch carries the work down upon the spring pad *E*, carrying it through the opening in the die-block and bending up the edges.



Press tools that do forming in both directions of the stroke

Upon the completion of the down stroke, the hooks *H* latch on pins in the ends of the forming bar *J*, carrying it upward on the return stroke. During the first part of the return stroke, punch *D* remains against the die-block. When the forming bar rises, it carries up the spring pad and the work, the straight edges of the work being forced inward to an angle of 30 deg. by the beveled, inner edge of the punch *D*. At the moment the edges are formed, the hooks are disengaged from their pins, being tripped by their upper ends coming in contact with the dogs *K*. The forming bar then falls to its former position. As the punch *D* rises, the work is left on the die-block and, since the press is an inclined one, it slides off between the housings and into a receptacle at the rear.



The four 30-degree lips require special tooling to complete this piece in one stroke

As no great accuracy was required in the work, the four sides could be turned inward to an angle of 30 deg. without the use of supports. This condition was fortunate for the designer, as otherwise arrangements for stripping the work would have complicated the tools and added greatly to their expense.

A Simple Cam Grinding Fixture

BY ERNEST DELBRIDGE

The fixture shown in the illustrations has solved my cam grinding troubles, and may be of interest to others having small cams of like nature to grind. The fixture is very simple, inexpensive to build and can be used on almost any type of tool grinder.

Two upright V-guides are mounted on a base plate. A sliding block fits between the uprights and is free to slide up or down. The shanks of a master cam and of the cam to be ground pass through holes in the sliding block and are connected by gears at the back. The shank

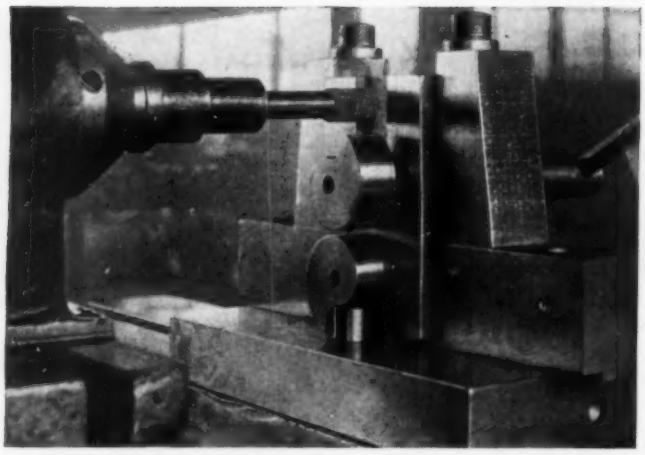


Fig. 1—Front of fixture, showing the master cam, the cam to be ground, and the abrasive wheel

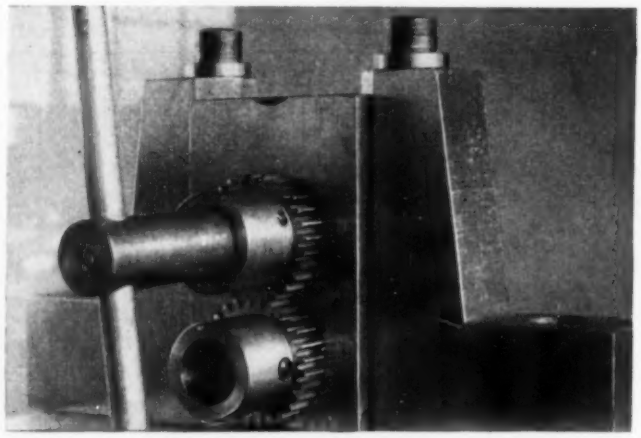


Fig. 2—Back of fixture, showing the gears by which the cams are rotated in unison

of the master cam passes through the lower hole and through the lower gear, the face of the cam resting upon a hardened pin in the base of the fixture. When the master cam is rotated, its contact with the pin in the base causes the sliding block to rise, carrying with it the cam to be ground.

After the master cam has reached its highest point, the sliding block drops down by gravity, bringing the lowest part of the cam into contact with the pin. Since the shanks of the master cam and of the cam to be ground are geared together, their movements must be the same.

Holding Drills in the Tailstock Spindle

By Charles Kugler

From the conditions of the holes in the tailstock spindles of some lathes, it is evident that neither the construction nor the function of tailstocks have been understood by the users. I have seen men hold a $\frac{1}{4}$-in. drill in the tailstock spindle of a precision lathe. First, the shank of the drill revolved in the hole, scoring it badly. Then a mallet was used to drive the drill in tighter. The result was that when the drill began to cut, the spindle key was sheared off, and the spindle turned around.

It is not surprising that lathes given such treatment develop tailstock troubles and are of no use for accurate work. In some shops, cutting tools are not allowed to be used in tailstock spindles. However, there should be no objection to using small drills in such a manner, providing they are held in a chuck having a taper arbor to fit the hole in the spindle.

The key that prevents the tailstock spindle from turning is designed only to resist the slight tendency of the spindle to revolve because of the friction between the work and the center.

Where drills are to be used by holding them against the tailstock center, and there is no drill holder available, a dog should be clamped on the drill, and a stick of wood placed between the tail of the dog and the drill, its free end resting on the wing of the carriage. To prevent the drill from coming off the center, a tool held in the toolpost should be placed sidewise against the dog. When feeding the drill by the tailstock screw, the carriage will move along with it. I have seen serious accidents occur when this latter precaution has not been heeded, injuring both the lathe and the operator.

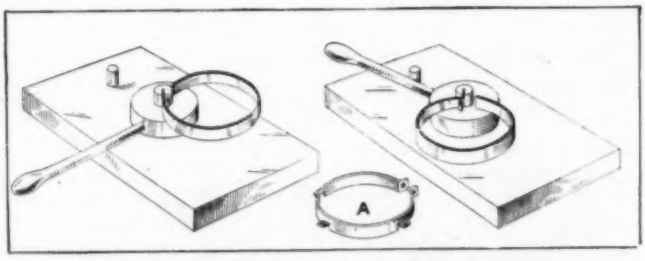
Tool for Bending Ears on Clamps

By Charles H. Willey

Asst. Plant Supt., Hoyt Electrical Works

In the illustration, a tool is shown for bending ears on the ends of clamping bands, such as the one shown at *A*. The sides of the bands were notched and the lugs were bent outwardly in a previous operation in a tool described on page 421, Vol. 72, of the *American Machinist*.

The tool under consideration consists of a base having a stationary pin, slotted to take the end of a band. Over



A pin in the rotating turret produces the bend

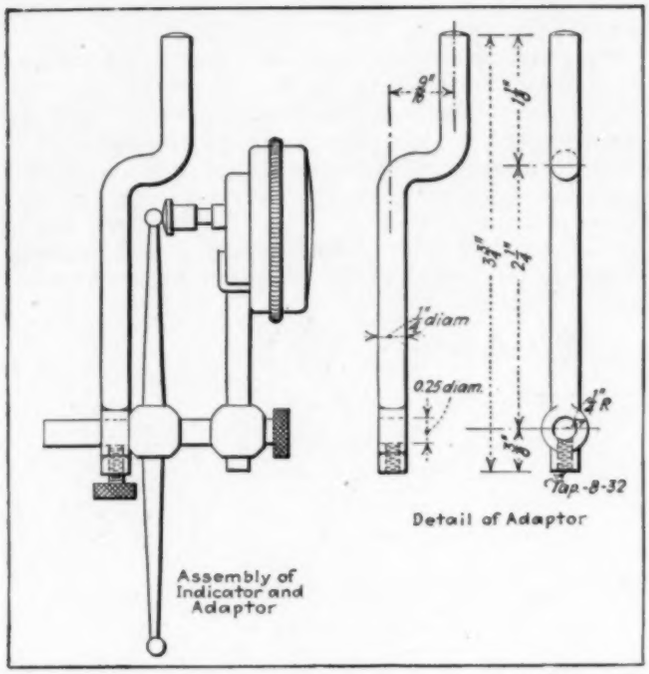
this pin is fitted a collar that can be revolved around it. A pin in the collar serves to bend the ear when the collar is revolved by means of a lever. A pin in the base serves as a stop for the lever, limiting the angle of the bend. After an ear has been bent on one end, the position of the band is reversed and an ear is bent on the other end. With this tool the ears have been bent on 600 bands in an hour.

Adapter for Universal Indicator

By Henry Ball

I submit herewith an adapter which I designed for use with a Starrett universal indicator. It is easier to drill small holes in jigs, fixtures, and dies on a milling machine than to "hang them up" on a lathe face plate.

It is impossible to offset a standard indicator when used with the regulation clamp to indicate a plug or hole smaller than $\frac{5}{8}$ in. in diameter, whereas, with the offset adapter shown, held in an ordinary drill chuck, the same indicator is capable of indicating the smallest



A device that extends the range of the universal indicator

hole that the ball end of the indicator bar will enter.

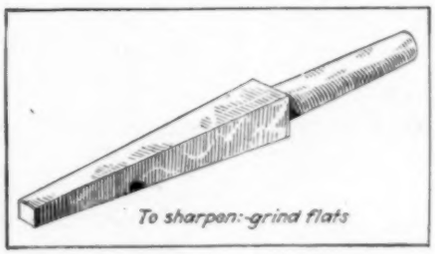
With the offset adapter, the universal indicator with internal attachment has a capacity from zero to approximately 2 in. in diameter. Beyond this, the clamp should be used.

Making Tight Plug Cocks—*Discussion*

By James G. Turton
Heald Machine Company

In an article under the title given above, on page 312, Vol. 72, of the *American Machinist*, an inquirer asks how to make plug cocks tight.

During my apprenticeship in England, I had experience in the mass production of plug cocks, and give the following points on their manufacture. The tapered holes in the bodies were reamed with roughing and finishing reamers of the square type, as shown in the illustration. The reamers were made of a high grade of tool steel. High-speed steel for the finishing reamer is unsatisfactory, as minute faults are developed on the cutting edges. It is essential to run the reamer, or the work, at a relatively slow speed, and for this purpose we ran the machine with the back gears engaged.



Reamer for cock bodies

The surfaces produced were highly burnished and were admirably suited to require but minimum work in the lapping. For ¾-in. cocks, a production of 120 per hour was secured on a hand-feed turret lathe. The tapered plugs were turned with single-pointed tools having a negative top rake, the work being done on a specially-converted semi-automatic lathe. The lapping was done on a special, five-spindle lapping machine, using burnt core sand sifted through fine-mesh muslin and mixed to a paste in water, for the abrasive.

During the lapping, the paste was kept at the center of the plug at first, the plug being lightly touched with a further supply of the paste on the spots that showed up dark after a few minute's lapping. These methods were used on cocks up to 1 in. in diameter and could probably be modified for cocks of larger sizes. When using large-sized square reamers, pieces of soft wood were fitted along two of the opposite flats, preventing any tendency for the reamer to chatter.

Gaging Three-Fluted Taps

By Prof. N. N. Sawin
Research Engineer, Skoda Works, Pilsen, Czechoslovakia

Experiments conducted in the Skoda Works to compare various designs of taps have confirmed the well-known fact that under equal conditions three-fluted taps perform better than those with four flutes. They turn out threads more exact in shape. The torque required for cutting with them is from 20 to 30 per cent less as shown by the test results plotted in Fig. 1. In spite of these advantages, the manufacture and use of three-fluted taps have been neglected on account of the difficulty encountered in measuring their mean diameter.

In an attempt to remove this drawback, Messrs. Hercigonja and Krcek, engineers of the Skoda Works developed the measuring instrument illustrated in Fig. 2. This instrument has been used successfully in the Skoda Works for the rapid and exact gaging of three-fluted taps.

The measurement is made by a micrometer over an

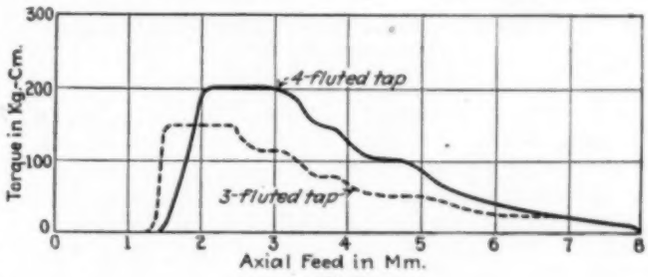


Fig. 1

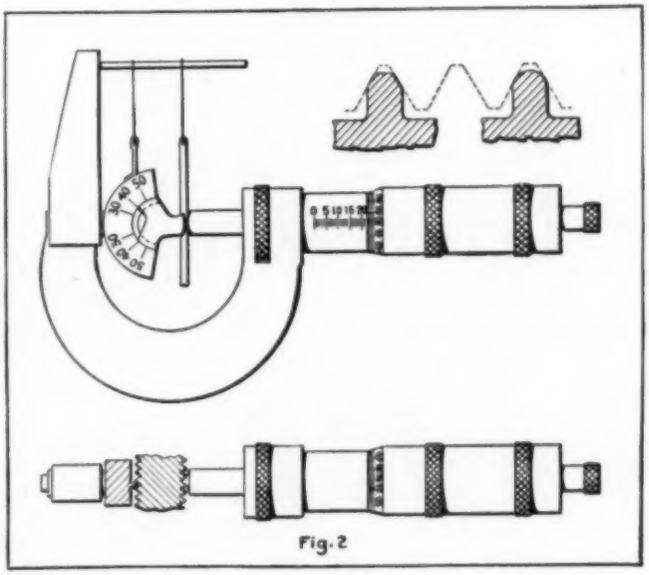


Fig. 2

internally threaded segment engaging two flutes and a pair of wires engaging the third. To avoid errors due to variations in lead and form of thread, the segment is made with one, two, or at the most three threads with truncated or rounded form. The micrometer reading does not of course give the true top diameter. Corrections must be made for the size of the wires, the thickness of the segment, and the difference between the mean diameter of the tap and that of the segment. This last quantity is shown diagramatically in Fig. 3, where δh is the measuring deviation. The size of δh depends on the angle α of the flutes and the difference in mean diameters. The angle α is read on a scale in the segment during the measuring operation. This scale also insures a symmetrical position of the tap with reference to the axis of the micrometer. A mathematical table is used with this device to compute values of δh and to make the other corrections necessary to obtain the mean tap diameter from the micrometer reading.

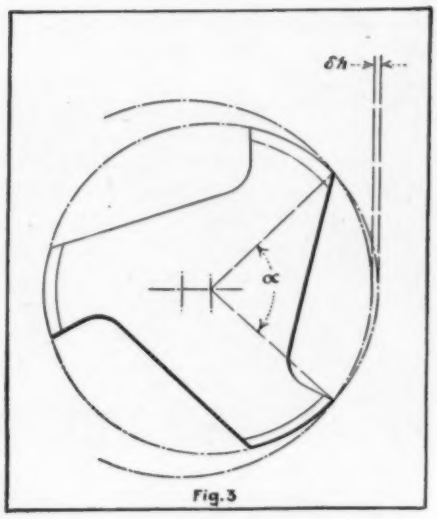


Fig. 3

A Problem in Shaper Work—*Discussion*

By Samuel D. Reynolds

The problem presented by James Henderson in Vol. 71, page 294 of *American Machinist* is subject to both mathematical and graphical solution. The conditions of the problem as originally given are not consistent. The text reads that the groove should be machined at an angle of 60 deg. with the front and back faces of the block. The sketches show the groove making an angle of 60 deg. with the intersection of the top and back faces.

The graphical solution is self-explanatory. It consists in projecting the block to the position where a normal view of the groove is obtained. Measured in this position, the angle θ is found to be 14 deg. 30 min.

The first step in the mathematical solution is the determination of the true angle between the top of the groove and the intersection of the top and back faces. Fig. 2 is constructed by passing through point *O* a plane parallel to the bottom of the block and another parallel to the side faces.

$$\text{Then:}\quad \tan 30^\circ = \frac{a}{b}$$

$$a = b \tan 30^\circ$$

$$\cos 30^\circ = \frac{b}{c}$$

$$c = \frac{b}{\cos 30^\circ}$$

$$\tan \phi = \frac{a}{c} = \frac{b \tan 30^\circ}{\frac{b}{\cos 30^\circ}}$$

$$= \tan 30^\circ \cos 30^\circ$$

$$\phi = \tan^{-1}\left(\frac{1}{\sqrt{3}} \times \frac{\sqrt{3}}{2}\right) = \tan^{-1}\tfrac{1}{2}$$

$$= 26^\circ\ 34'.$$

The angle sought is $90^\circ - \phi$ or $63^\circ\ 26'$.

Fig. 3 is constructed by passing a plane through line *OA* (Fig. 1) parallel to the sides of the block. Another plane (*OCB*) is passed perpendicular to the groove and intersecting the first plane. Then:

$$\tan \theta = \frac{BC}{OB}$$

$$\sin 26^\circ\ 34' = \frac{BC}{AB}$$

$$BC = AB \sin 26^\circ\ 34'$$

$$\tan 30^\circ = \frac{AB}{OB}$$

$$OB = \frac{AB}{\tan 30^\circ}$$

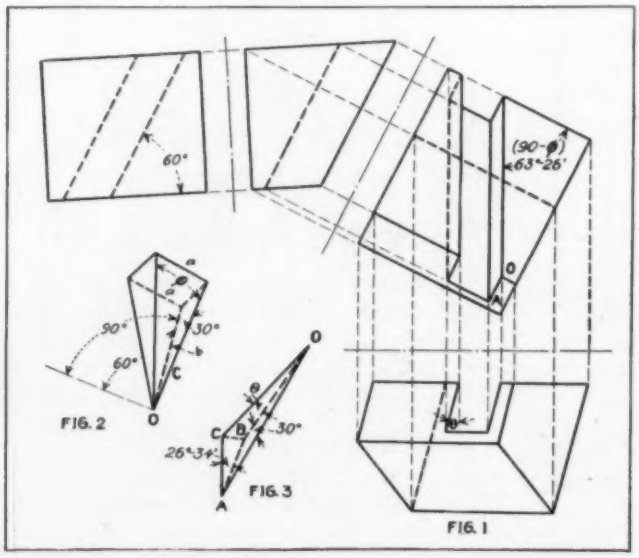
$$\text{Substituting:}\quad \tan \theta = \frac{AB \sin 26^\circ\ 34'}{\frac{AB}{\tan 30^\circ}}$$

$$= \tan 30^\circ \sin 26^\circ\ 34'$$

$$\text{and}\quad \theta = 14^\circ\ 30'.$$

Therefore the mathematical solution checks the graphical solution.

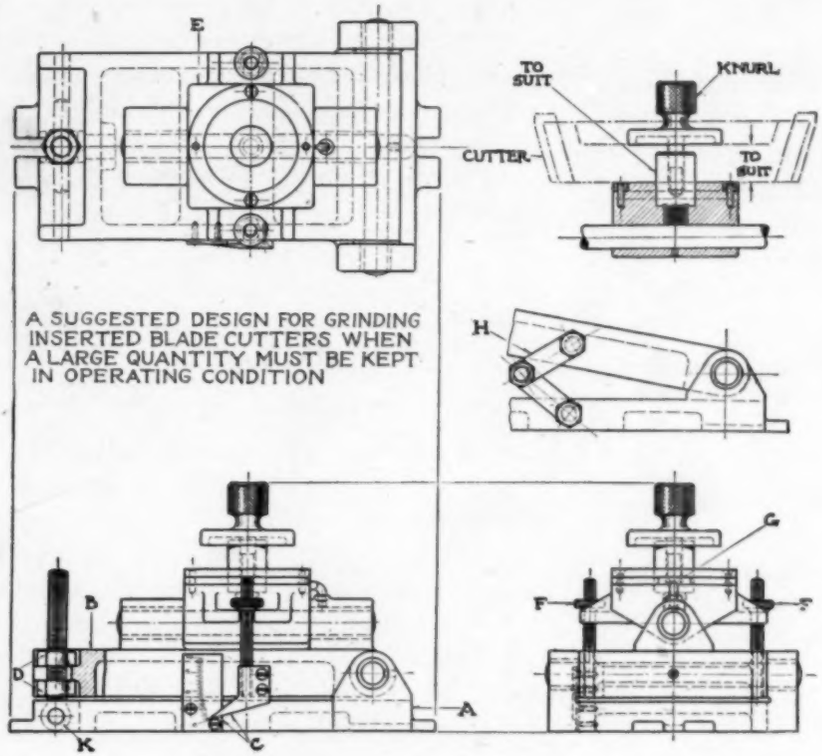
If it is assumed that Mr. Henderson's sketches are correct, φ will equal 30 deg. Using this value, and solving for θ as above, the result will be 16 deg. 6 min.



Editor's Note:—To refresh the reader's mind, this problem concerns a cast-iron block with a 12-in. square base, the sides perpendicular to the base, and the top inclined 30 deg. to the base. A shaper is used to cut a groove diagonally across the upper face at an angle of 60°. The bottom of the groove must be parallel to the upper face and the sides perpendicular to the lower face. To what angle must the shaper head be set to meet these conditions? One more discussion is yet to be published.

Grinding Tungsten-Carbide Tools

Quantity Grinding and Inspection

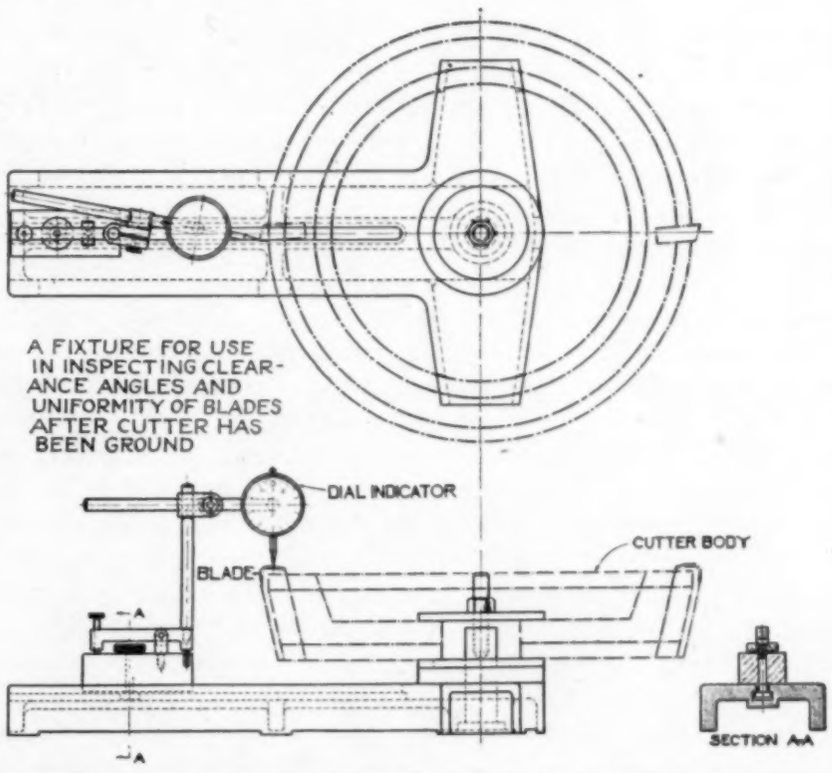


A SUGGESTED DESIGN FOR GRINDING INSERTED BLADE CUTTERS WHEN A LARGE QUANTITY MUST BE KEPT IN OPERATING CONDITION

Recommended for use when a large number of inserted-blade milling cutters must be kept in condition, this grinding fixture permits angular adjustments in two directions. The base, *A*, has the sub-base, *B*, attached to it, which can be elevated from zero to 20 deg. The graduated plate and pointer at *C* aid in adjusting the sub-base to the proper angular position where it can be held by the locknuts, *D*. The clamping block, *E*, on which the cutter is mounted, is of the trunnion type, set to the desired angle by means of the adjusting nuts, *F*. Graduations are provided at *G* for rapid setting of the proper angular position. At the upper right is shown a cross-sectional view of the clamping block with a cutter in place. The clamping device, *H*, insures extreme rigidity, even after the eye-bolt, *K*, has become somewhat worn.

Careful inspection of reground cutters, particularly of the clearance angles and blade uniformity, can be made with the fixture illustrated. The cutter is fitted over a hardened plug and rests on a hardened plate, being located in such a way that it is held in the fixture from the surfaces used for clamping and aligning in the milling machine. A dial indicator mounted on a sliding block is used to inspect the ground surfaces of the blades. The cutter can be revolved, thus allowing inspection for variations in the top faces. The indicator can be readjusted also so that the periphery of the blades can be similarly inspected. Variations as high as 0.002 in. are permissible on the outer diameter, but the top faces must be ground to within 0.0005 inch.

Drawings from "Carboloy"



A FIXTURE FOR USE IN INSPECTING CLEARANCE ANGLES AND UNIFORMITY OF BLADES AFTER CUTTER HAS BEEN GROUND

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American Machinist

Editors: KENNETH H. CONDIT AND FRED H. COLVIN

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Too Much Machinery

THE superintendent of a big eastern plant complains that the standard toolroom lathe, satisfactory as it is for the general run of work, is too complicated for some of the regular jobs in his toolroom. He has enough work of short length to keep busy several machines of the type he wants. These machines need not accommodate more than eighteen inches between centers, they do not need a leadscrew nor most of the other customary refinements, but they must be accurate.

Is this requirement a typical one? If so, perhaps some lathe builders have been overlooking a market. Possibly there are similar markets for correspondingly simplified machine tools of other types. At any rate, in these not so busy days, any market that is at all promising deserves study.

*

Responsibility

WHEN one takes the time and trouble to analyze the distribution of employment among the quarter million factories in the United States, as did Ernest F. Du Brul of the National Machine Tool Builders' Association, one finds that fifty-eight per cent of the factory wage-earners are employed in and by approximately four per cent of the factories—ten thousand factories out of two hundred fifty thousand.

This does not even mean that ten thousand companies employ this percentage; many of the larger companies have several factories. Therefore, it must follow that fewer than ten thousand executives of manufacturing companies must carry a sixty per cent responsibility for the rise and fall of employment. Theirs must be the responsibility of keeping cool heads in dull times and in boom times. To them must the country look for any important action in the difficult task of straightening the employment curve.

That the major responsibility belongs to the ten thousand, does not relieve the minor responsibility of the two hundred forty thousand executives controlling the smaller factories of the country. Argue as they may that the bigger executives might have guided their projects more wisely through the peaks of 1929, that sounder control of booms will minimize any consequent depressions, the two hundred forty thousand must work shoulder to shoulder with the ten thousand to avert future booms and depressions. After all, the workers and families represented by employment statistics are not so many Arabic numerals; they are human beings with clear claims to a decent and happy life. Forty per cent plus sixty per cent equal many millions. To them is the prime responsibility of the executives of all industry.

*

Mexico

WALLACE THOMPSON, editor of Ingeniería Internacional, recently returned from his first trip to Mexico since 1921, brings optimistic reports on changes in that country within the decade. Mexican living standards reflect marked advances as evidenced by the extended consumption of electric power, the demand for radio and other innovations, and the adoption of modern modes in dress. This evolution is particularly noticeable among the poorer classes.

President Rubio, recovered from his assassin-inflicted wound, is taking a firm grip on the reins of government and surrounding himself with strong and sympathetic advisors. Indeed, his rivals appear to be thinking in terms of the election six years hence—truly a new school of Mexican political philosophy. While the government does not wish to make commitments toward the establishment of long range precedents, its attitude toward outside business interests is distinctly conciliatory.

But the most interesting change is in the Mexican attitude toward the United States. Anti-Uncle Sam propaganda has disappeared, and in its place has grown a genuine desire for industrial co-operation from the North. As Mexico is widely regarded in South and Central America as a barometer of our foreign policy, this amicable sentiment is particularly gratifying. Ambassador Morrow has done much to put this friendship on a firmer basis than has existed since the days of Diaz. May a worthy successor to Mr. Morrow be found to carry on a work well begun.

SHOP EQUIPMENT NEWS

"Modern" Types H 2 and V-1 Tungsten-Carbide Lapping Machines

TWO distinct types of diamond lapping machines for tungsten carbide tools are being built by the Modern Diamond Tool Company, 1050 Mt. Elliott Ave., Detroit, Mich. The Type H 2, illustrated in Fig. 1, has the composite wheel placed in the vertical plane, whereas that of the Type V-1, illustrated in Fig. 2, lies in the horizontal plane. Both of these machines employ a composite lapping wheel claimed to cut considerably faster than the plain iron wheel. These composite wheels are made up with the countersunk copper rivets placed in the surface, the countersunk portion and the rest of the iron surface being charged with diamond powder. Special types of these wheels are made to fit universal cutter grinders or surface grinders.

In the lapping operation it is necessary to keep the wheel slightly moist with a mixture of olive oil and diamond powder. The cutting action resulting is very fast and a keen sharp edge can be produced quickly. The edge produced is sharp and has a true shearing action, and is claimed to last from 20 per cent to five times longer than a plain ground tool.

The Type H 2 lapping machine requires a ½-hp., a.c. or d.c. motor to drive the wheel. The angle gage is 45 deg. right or left, and a cross table slide is provided. The table tilts down 20 deg., and 10 deg. up, and the distance from the surface to the floor is approximately 38 in. The over-all dimensions are 24x26x44 in. and the weight 315 pounds.

Fig. 1—"Modern" Type H 2 Tungsten-Carbide Lapping Machine, which has table adjustment up and down and to and from the wheel, together with angular adjustments of the tool itself on the table

Fig. 2—"Modern" Type V-1 Diamond Lapping Machine for tungsten carbide. Work guides are provided

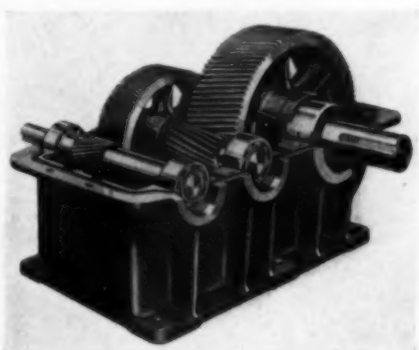
The type V-1 machine, illustrated in Fig. 2, has a table 36x24 in., 38 in. from the floor. The diamond lapping wheel is 11 in. in diameter.

"Titan" Helical and Herringbone Speed Reducers

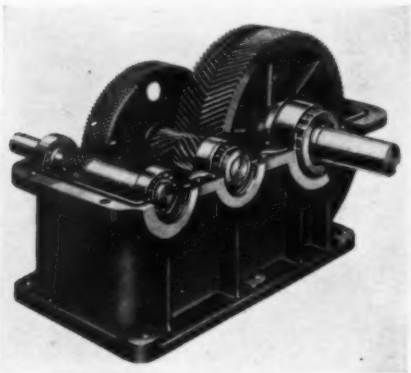
Anti-friction speed reducers, known as "IXL Titans," have been placed on the market by the Foote Bros. Gear & Machine Company, 111 No. Canal St., Chicago, Ill. Speed reducers are available with either herringbone gears or helical gears, the helical type having slight bearing modifications. They are made in both single and double reductions, the herringbone type being designated as the Types SB and DB and the helical at-SX and DX, respectively. The ratios are standard and apply to all sizes for each type of reducer. On the single-reduction units, types SB and SX, the ratios range from 2.87 to 9.9, and on the double-reduction units, types DB and DX, the ratios range from 9.95 to 96.2. Because of this standardization of ratios, spare parts are carried in stock.

Many features in common are found on the herringbone and helical speed reducers. The cases are cast from close-grained grey iron, and ribs are provided at each bearing for rigidity. The inside of the upper case is ribbed at the top as an added precaution against longitudinal vibration. No gaskets are used between the halves as accurate machining makes this unnecessary. Oil return grooves are provided for the return of the lubricant to the bottom of the case, and splash lubrication is standard.

Anti-friction bearings have been adopted as standard on the "Titan" reducers. High-speed shafts are mounted on ball bearings and slow-speed shafts on roller bearings. It is therefore claimed that the efficiency of the single-reduction units ranges as high as 98 per cent for low ratios



Open view of the "Titan IXL" Helical Speed Reducer with heat-treated and hardened gears



IXL "Titan" Herringbone Speed Reducer of the double-reduction type

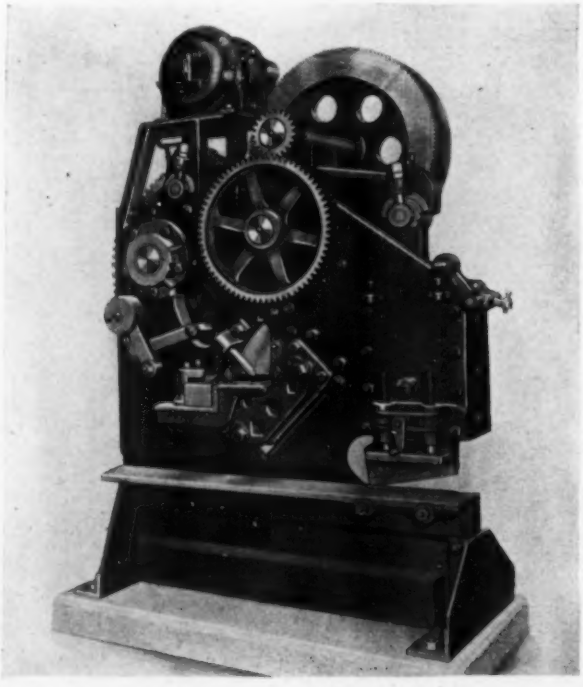
and on the double-reduction units to 96 per cent for low ratios.

Although the "Titan" herringbone and helical reducers are designed almost alike, there are certain features which can be adopted in the design of the helical reducer that are not practical with the herringbone type. These affect principally the horsepower rating and conservation of space. Heat-treated and hardened gears have been adopted in the helical reducers, giving greater load carrying capacity than the herringbone, size for size and weight for weight, because the herringbone gears are not heat-treated. It is possible to obtain a horsepower rating on the slow speed shaft of the helical reducer at least 25 per cent higher than the rating for the herringbone reducer of the same size. The helical type is also capable of carrying considerable thrust load.

"Buffalo" Nos. 2½, 3½ and 4½ Universal Shears

THREE universal shears known as the Nos. 2½, 3½ and 4½ have been added to the line built by the Buffalo Forge Company, Buffalo, N. Y. They are built in the same manner as the previous smaller machine and also have armor-plate frames. One eccentric runs both tools, the shear and the bar cutter, in succession; that is, both tools are actuated during the course of one revolution of the eccentric, but not at the same instant.

Shear blades are reversible and provided with four cutting edges. The bar cutter is the same as on other "Buffalo" shears, and angles can be cut on a miter without inclining the stock. The capacities given below are based on soft steel, that is 15 to 20 carbon steel having tensile strength of 65,000 lbs. per sq. inch.



Buffalo Universal Shear now available in the Nos. 2½, 3½ and 4½ sizes as well as the previous model

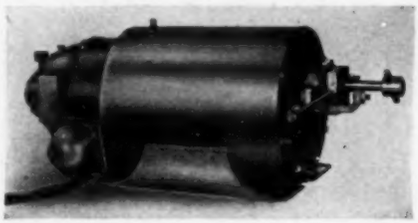
	No. 2½	No. 3½	No. 4½
SHEAR			
Plates—Through center, in.	¾	7/8	1¼
Trimming, in.	½	1	1⅜
Flats—with standard knives, in.	6x⅞	7x1	7½x1⅜
With special upper knife, in.	3x⅞ 10½x½	3½x1 6x⅞	4x1½ 14x¾
Trims Angles	6x¾	6x⅞	6x1
Length of Knives	12	13¾	16½
BAR CUTTERS—With standard knives			
Rounds, in.	2¼	2½	3
Squares, in.	2	2¼	2⅝
Angles, 90 deg.	6x½	6x⅝	6x⅞ or 8x⅝
Angles, 45 deg.	4x½	4x9/16	6x¾
Tees, 90 deg.	4x5x½	4x5x9/16	6½x6½x½
I-Beams and Channels—With special knives	9 in., 21.8 lb.	10 in., 30 lb.	12 in., 35 lb.
Channels	10 in., 20 lb.	10 in., 30 lb.	12 in., 35 lb.
H-sections	6 in., 22.8 lb.	6 in., 26.7 lb.	8 in., 35 lb.
Bethlehem beams	9 in., 20.5 lb.	10 in., 26 lb.	12 in., 36.5 lb.
Angles—square, in.	4x6x⅝	3½x7x¾	6x8x¾

Westinghouse Carriage Driving Unit

A combined motor with three-speed reduction unit has been developed by the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., to drive work handling devices for automatic welding. The requirements of the service are high gear reductions with wide speed ranges and compactness. It is also necessary that provision be made for engagement and disengagement of the drive while the motor is running.

The gear ratios in the three gears are 534:1, 1295:1 and 3060:1. With field control on the motor, an uninterrupted speed selection between 0.393 r.p.m. to 6.67 r.p.m. is obtainable at the final shaft. The torque output rating is limited by the strength and wear resistance of the mechanical parts. This is 1,500 in. lb. with hardened gears and 400 in. lb. with untreated gears.

Three speed notches are provided



Westinghouse Combined Motor and Three-speed Reduction Unit for driving work handling devices for automatic welding

in the shifting rod, which passes through the hollow output shaft. The shifting lever has an engaging and disengaging position in each of the notches.

All gears are of the spur type and all bearings of the anti-friction type. The gear shafts and bearings are mounted in gear frames which can be removed from the housing as two separate units for inspection and replacement.

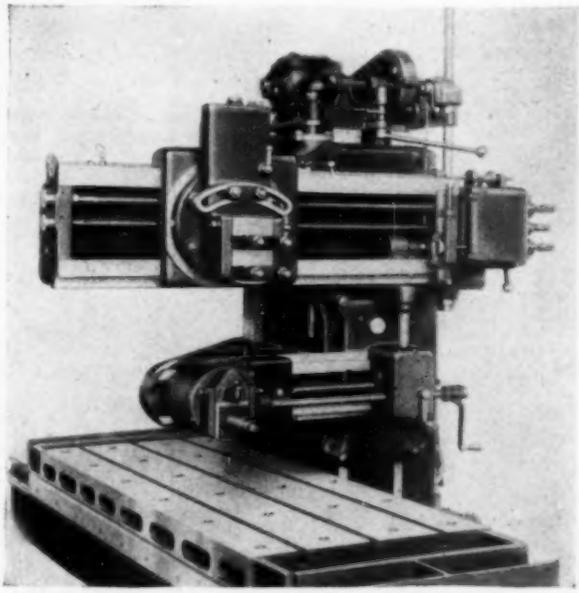
The unit has been applied to the ⅓-hp., 1,140 r.p.m., 60 volt, d.c. motor in the 7-A SK frame.

Side Head for Rockford Hydraulic Planer-Shaper

For machining locomotive driving boxes, an attachment in the form of a side head securely anchored to the L-type rail, and having a rigid back support clamping to the rear of the column, may be had for the hydraulic planer-shaper built by the Rockford Machine Tool Company, Rockford, Ill. As the hydraulic planer-shapers are built in 42-, 66-, and 90-in. strokes, one or more boxes may be machined at one time. Both the seat for the brass and the bearings for the oil cellars are machined in one set-up. The advantage of this attachment in machining driving boxes is that all surfaces are machined from the same center line.

This attachment has both hand and power feeds as well as rapid traverse in all directions. The entire unit is easily removed at any time and replaced by the standard side head.

The hydraulic planer-shaper was described on page 681, Vol. 71, of the *American Machinist*.



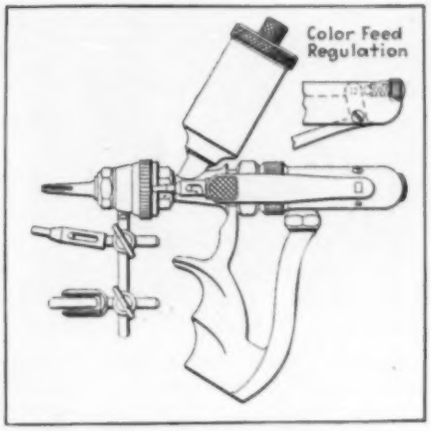
Attachment for machining locomotive driving boxes on the hydraulic planer-shaper built by the Rockford Machine Tool Company

Paasche Type UHT "Hudson" Production Striper

Developed in co-operation with the Hudson Motor Car Company, the Type UHT "Hudson" production striper for the application of striping to automobiles and other products, is being offered to the trade by the Paasche Airbrush Company, 1909-27 Diversey Parkway, Chicago, Ill.

This tool is convertible and adjustable for any position. The handle and guides are removable for convenient access into narrow places, and nibs or striping blades in a variety of styles and sizes can be supplied to meet all striping requirements.

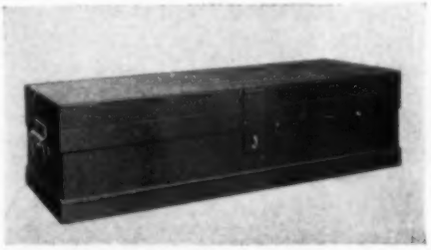
Among the features of the type UHT striper are: interchangeable nibs for a variety of stripes; revolving ball-bearing turret head with auto-spring stop for circular striping; swivel adjustable guide with or without guide wheel; slanting swivel removable color cup assembly; compression needle packing, eliminating sticking of needle or leaking of color; adjustable thumb action lever for slow or fast color control; hand-fitting removable handle with air-space for cooling the hand, and completely standardized construction.



Paasche Type UHT "Hudson" Production Striper for applying striping to automobile bodies and other products

"A-S-E" All Steel Tool Chest

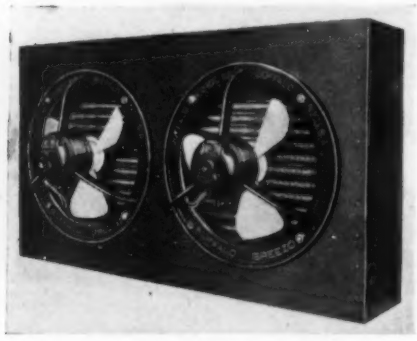
An extra large and heavy tool chest designed for manufacturers and installers of equipment, particularly when it is necessary for the workman to carry a complete set of erection tools to each job, is being offered by the All-Steel-Equip Company, Aurora, Ill. This chest is made of 14-gage sheet steel and equipped with handles on each end. It is reinforced by bands on the top and bottom and around the cover. A hasp and staple for padlocking purposes are provided.



"A-S-E" Heavy-Duty Steel Tool Chest

"Buffalo" Twin "Breezo-Fin" Unit Heater

Lowest heating cost of its entire line of unit heaters is claimed for the twin "Breezo-Fin" developed by the Buffalo Forge Company, Buffalo,



"Buffalo" Twin "Breezo-Fin" Unit Heater. One or both fans may be used

N. Y. It is also said to be quieter than single-fan heaters of equivalent capacity. When desired one of the 16-in. fans may be shut down, thus lowering the steam consumption and reducing the temperature. The 16-in. twin "Breezo-Fin" has Aerofin heating coil, and only one set of steam and drip connections are required.

"Oster-Williams" Threader and Reamer for Small Pipe

The No. 0.001 "Chip Chaser" for ½- to 1¼-in. pipe is available from the Oster Manufacturing Company, 2057 61st St., Cleveland, Ohio, and from the Williams Tool Corporation, Erie, Pa. This tool is built on the same principle as the No. 00 "Chip Chaser," but has an improved, open-type diehead that allows unusual chip clearance and makes it easy to lubricate the pipe.

The No. 0.001 "Chip Chaser" has four dieheads, ½, ¾, 1, and 1¼ in., and

"Oster-Williams" Reamer fitted to No. 001 "Chip Chaser" Ratchet Handle

a ratchet handle. The ratchet is built into the handle out of the way, but is so placed that the operator can reverse the action or put it in neutral position with a flick of the thumb.

The "Chip Chaser" reamer fits the ratchet handle and is sturdily made.

Brown & Sharpe Nos. 00 and 00G High-Speed, Automatic Screw Threading Machines

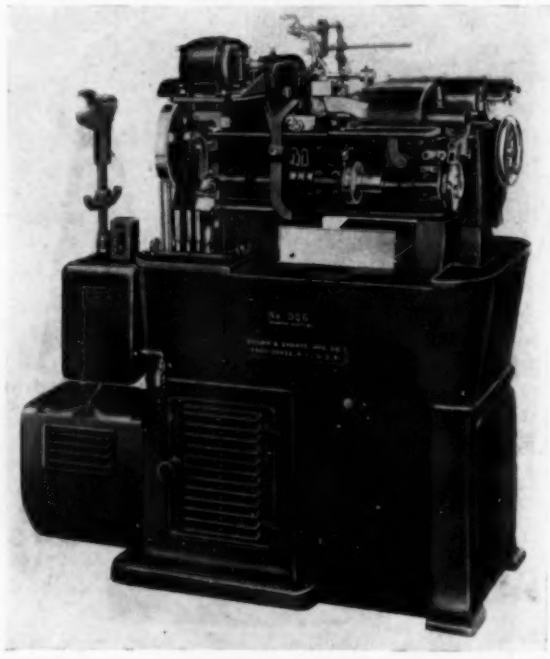
THE Brown & Sharpe Manufacturing Company, Providence, R. I., announces the redesign of the Nos. 00 and 00G high-speed automatic screw threading machines. These machines are now provided with a greater range of speeds, and are adaptable to the manufacture of parts from steel as well as brass, aluminum, and other freely cut metals. Both the work spindle and the die spindle have a range of 20 speeds each, providing 30 combinations of speeds, which enable the most efficient threading and work spindle speeds to be selected for any material. The speed ranges are obtained through change gears, belts, and pulleys.

All important features of the previous designs have been retained. Both the work and the die spindles run in the same direction, but at different speeds, the difference in speeds permitting the die to run on at the required surface speed, after it has been fed to the threading position.

The tripping mechanism provides an accurate control for the length of stock threaded by stopping the die spindle instantly, when the thread is cut to the required length, leaving the die to run off at the speed of the work spindle.

The screw threading machines can be equipped with a vertical slide for cutting off, leaving the cross slides free for forming and other operations. The automatic rod magazine, whereby hand stocking of the machine is eliminated, is also adaptable to use with the screw threading machines of this type.

Certain classes of nuts and tapped parts can be manufactured on these machines by mounting a tap in place of the die in the die spindle. Should one operation be required, the die spindle can be arranged for holding a drill, a maximum drilling speed of 12,000 r.p.m. being available if desired for very small drills.



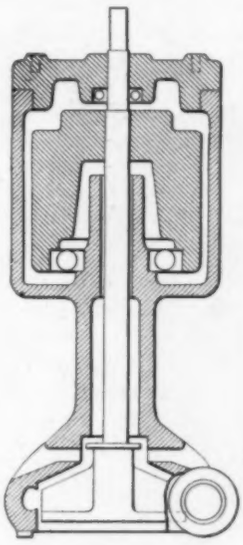
Thirty speeds are available on the Brown & Sharpe Nos. 00 and 00G, High-speed, Automatic Screw Threading Machines

The speed ranges of these machines make them particularly suitable for production work.

"Gyro" Coolant Pump

Sizes to furnish 10, 20, or 50 gal. per min. are available in the "Gyro" coolant pump developed by The Equipment Company, 6351 Brush St., Detroit, Mich. This pump has no packings to leak and no screen to clog. It is always primed and the coolant cannot contact with the bearings. It is claimed that water is handled with equal efficiency.

A variety of drives can be had to



Photograph and cross-section of the "Gyro" Coolant Pump built in capacities of 10, 20 and 50. gal. per min. No packings are employed

meet conditions. The drive shaft is integral with the counterweight, as shown in the accompanying cross-section, and the sealed ball bearing is packed with grease, permanently lubricated. The counterweight is balanced and eliminates vibration and chatter marks, and thus maintains concentric operation and distributes wear on the ball bearings.

The arches above the impeller are specially designed to eliminate swirl in the tank. The intake is by gravity feed and the outlets are standard pipe threads with plenty of clearance for nipples and elbows. An open bottom is employed, thus no pan is present to collect chips or grit.

Ashdown "Rotoscope"

The Ashdown "Rotoscope," invented by A. J. Ashdown, London; manufactured in England; and distributed in the United States by Livingston & Southard, Inc., 17 Battery Place, New York, N. Y., is an instrument operating on the stroboscopic principle, by means of which the observer's vision is "geared up" to the speed of any rapidly moving object. With the device periodic motion, whether rotary, oscillatory, vibratory or reciprocating, can be observed and studied, and the exact speed of the moving object can be determined without physical contact of any kind with the object. Slow motion study and exact timing at any speed from 100 to 40,000 movements per minute can be accomplished without difficulties.

The chief feature of the Rotoscope is the rotary cylindrical shutter, capable of giving as many as a thousand glimpses per second, which blend into a continuous impression on the retina of the eye. The speed of this shutter can be varied by rapid adjustments with a tiny five-speed gearbox. Fine adjustment speed control is secured by means of a special centrifugal governor, thus achieving an accuracy well within 0.5 per cent.

The instrument is compact and light, weighing only 6 lb. With it the observer is able to make readings under practically any working conditions and without the aid of special illumination. It is operated by clock work and requires no electrical connections. The operator simply holds the instrument in his left hand with the shutter apertures to his eyes and controls the speeds with his right hand. By setting the speed of the shutter at exactly the speed of the moving object, the latter appears to be absolutely stationary. Its speed can then be read on the side of the instrument. By increasing or decreasing the shutter speed slightly, slow motion study can be achieved.

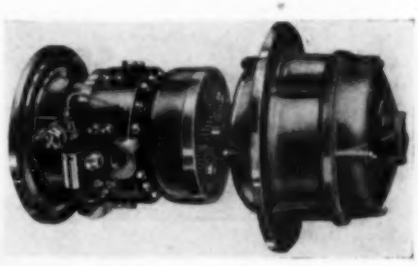
Applications of the Rotoscope include: the study and timing of gears, ball and roller bearings, springs, cams, valves, chain and belt drives, grinding wheels, bobbins, spindles, and high speed tools; synchronization; determination of speed losses from friction or slip; observation of vibration and deflection; and detection and elimination of the many mechanical troubles.

Observing the cutting action of a large drill with the Ashdown "Rotoscope"

Bussman Type BM High-Pressure Pumps

For use on broaching, bending, straightening, assembling, and testing presses, as well as presses for molding plastic materials, a hydraulic pump combining a low-pressure stage and a high-pressure stage has been placed on the market by the Index Machinery Corporation, 49 Central Ave., Cincinnati, Ohio. This pump is manufactured by Wilhelm Bussman of Muenchen, Germany.

Among the features of the pump



Bussman Type BM Hydraulic Pressure Pump driven by direct-connected motor and planetary reduction gears and ready for assembly into an hydraulic straightening machine

are the following: Low-pressure stage with a large delivery of oil for filling the cylinder, giving quick approach and return of ram; high-pressure stage with a small delivery of oil for pressing; automatic change from low to high pressure in four to five seconds by an automatic valve; quick pressure control by a handwheel, giving any desired pressure from 300 to 4,200 lb. per sq.in.;

variable delivery of oil in the high-pressure stage; high efficiency; automatic oiling through the pressure oil. These pumps are constructed so that they eliminate accumulator systems.

The housing of the Bussman pump is of cast iron with integral cast-steel pipes. All moving parts working under pressure are of chromium-nickel steel. The pumps can be arranged in the oil container or in the machine base. They are driven by electric motor with reduction gears. No foundation is required.

At present nine sizes are available, having capacities of 4.6 to 25.6 gals. per minute at the low-pressure stage and pressures of 30 to 210 lb. per sq.in., and capacities of 0.30 to 5.30 gal. per minute on the high-pressure stage and pressures of 4,200 lb. The sizes of the motors required range from 1 to 17.5 hp., and the net weights from 150 to 550 pounds.

Automatic Rod Magazine for Brown & Sharpe No. 2 Automatic Screw Machine

THE Brown & Sharpe Manufacturing Company, Providence, R. I., has announced an automatic rod magazine for the No. 2 automatic screw machine, adaptable to overhead and motor driven machines in both regular and high-speed types. This size automatic rod magazine is similar in construction and operation to the other sizes previously announced.

The mechanism of the rod magazine is connected with the feeding arrangement of the screw machine in such a manner that, when the end of the bar on which the machine is working passes a certain point, the machine, (except the spindle), is automatically stopped, the mechanism of the rod magazine is engaged, and a new rod fed from the magazine into the spindle to the working position. The machine is then started automatically. Sufficient rods can be inserted in the magazine at any time to keep the machine operating for a long period, the exact time depending on the type of work being done.

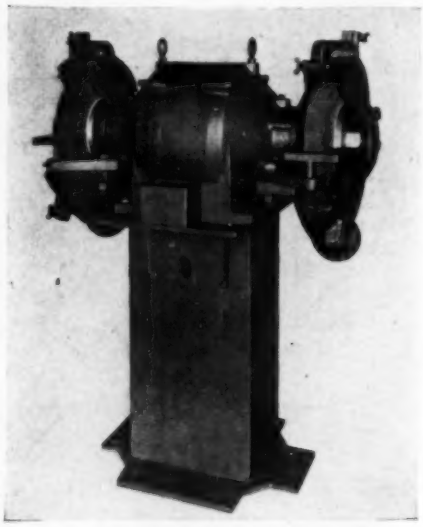
"One Profit" Pedestal Grinder

A complete line of grinders and polishing lathes are being marketed under the trade name of "One Profit" by the Production Equipment Company, Cleveland, Ohio. This unusual trade name is derived from the fact that the entire machine including the motor is manufactured in the above plant. In these machines steel replaces cast iron wherever possible. The bases are constructed from heavy steel shapes welded to form a compact and rigid support.

Fully enclosed motors are employed, designed and built for grinding and buffing applications and requiring no ventilation. Spindles of nickel steel are large and carried in over-size ball bearings mounted in grit-proof housings. Oil reservoirs provide clean oil.

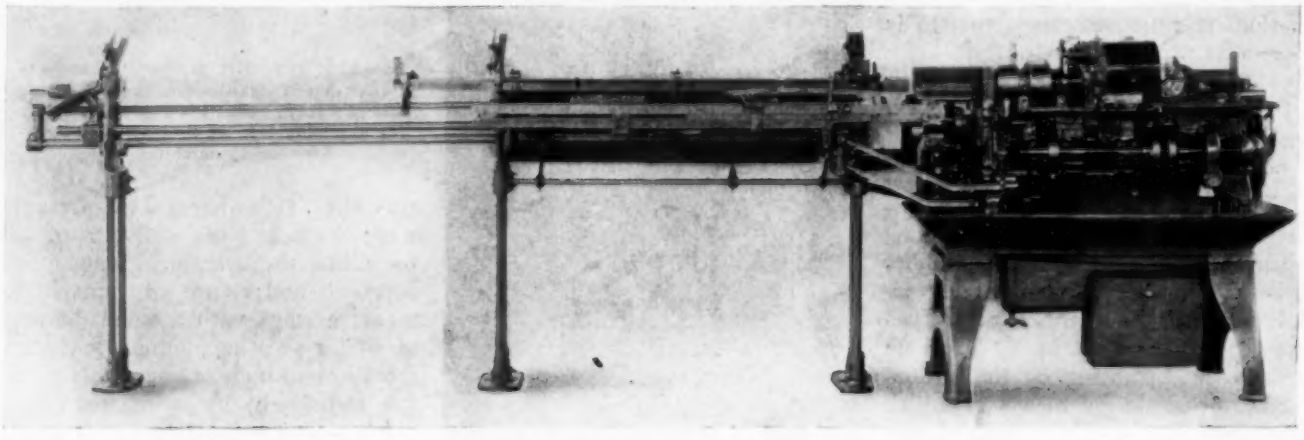
Control is effected by a push-button, automatic starter having overload and no voltage release. The started is mounted in the base.

"One Profit" grinders and buffers



"One Profit" Pedestal Grinder representative of a complete line for grinding and buffing operations

can be supplied in bench or pedestal types in sizes ranging from 1 to 15 hp. for normal-duty, heavy-duty, or super-service requirements. The design embraces both motor-in-head and motor-in-base types. Complete classification includes: multi-speed and selective speed machines; snaggers, double-disk grinders, combination disk and standard grinders, and combination grinders and buffers.



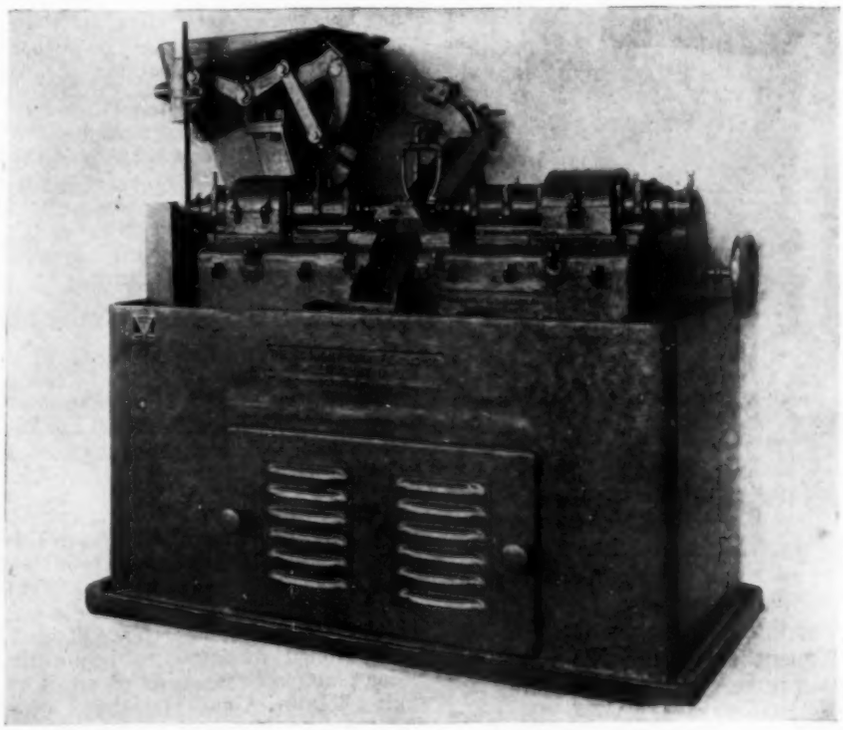
Automatic Rod Magazine adaptable to overhead- and motor-driven, regular- and high-speed Brown & Sharpe No. 2 Automatic Screw Machines

"Economy" Automatic Double-End Turning Machine

FOR chamfering, rounding up, finishing, and pointing edges and ends of various metal parts, the Economy Engineering Company, Willoughby, Ohio, has announced the adaptable, double-action unit illustrated. This machine is fully automatic, it being necessary only to keep a supply of blanks in the hopper. These are fed automatically to the tools where each piece is gripped in the center and machined on both ends simultaneously. Delivery is also automatic. One operator can attend five machines.

The machine is especially suitable for rapid pointing and chamfering of such parts as roller bearings, valve tappets, studs, and a wide variety of similar work. If desired, it can be furnished equipped with a grinding spindle for such parts as require this operation. It can also be adapted for handling headed parts.

The machine is operated by a motor installed in the base with a silent chain drive. Specifications are as follows: Capacity, diameter, 1 in. maximum; lengths, 5 in. maximum; width, 35 in.; height, 56 in.; length, 72 in.; net weight, 3,200 lb., and motor required, 3 hp. at 1,200 rev. per minute.

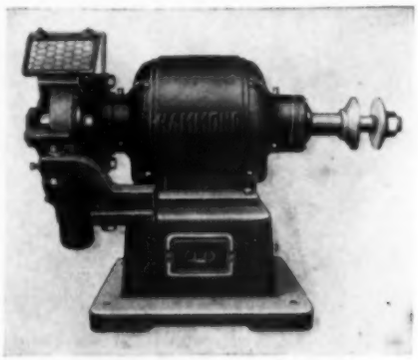


Chamfering, rounding up, finishing and pointing edges and ends of various metal parts are done on the "Economy" Automatic Double-End Turning Machine

Hammond Type LW Combination Grinder and Buffer

General-purpose requirements are met in the type LW combination grinder and buffer announced by the Hammond Machinery Builders, Inc., Kalamazoo, Mich. This machine will take a grinding wheel on one side and a buffing, polishing, or wire scratch wheel on the opposite end. The same general construction is embodied as in other grinders and polishers of the line.

The motor is designed especially for grinder service. The machine is furnished in ½-, 1½- and 2-hp. sizes. The 1½-hp. and larger machines are equipped with push-button control and a Cutler-Hammer automatic motor starter, which protects the motor from overload, low voltage, and phase failure.



Hammond Type LW Combination Grinder and Buffer for general-purpose requirements

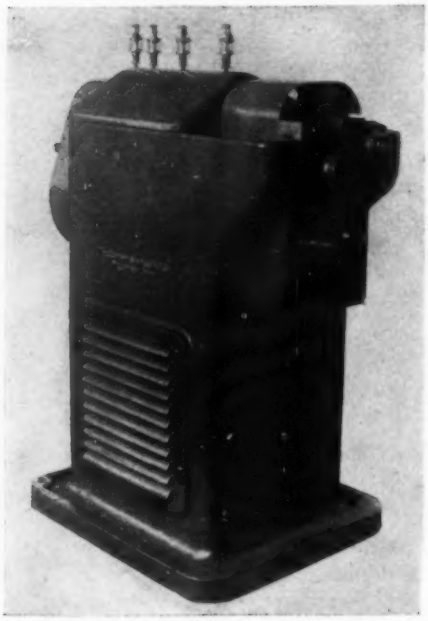
These machines are furnished for a.c. circuits of 110, 220, 440 and 550-volts, 25 to 60 cycles, one, two, or three phases, and in d.c. models for 110 and 220 volts.

"Economy" Type P Semi-Automatic Pointing Machine

For pointing studs, bolts, or rods from ¼ to ¾-in. in diameter and 5½-in. or more in length, the Type P semi-automatic pointing machine has been developed by the Economy Engineering Company, Willoughby, Ohio. This machine is claimed to produce at the rate of 1,200 to 2,400 pieces per hour and, except for inserting and removing the blanks, every movement is automatic.

The piece is inserted against the stock gage, where it is automatically gripped on the round. The stock gage moves aside and the pointing head moves forward automatically and finishes the point. Change gears are located in an oil-tight housing at the rear of the machine.

In construction, the "Economy" Type P machine is simple, sturdy, and compact. The spindle is driven by a silent chain from the motor mounted in the base. For adapting it to different size bolts, it is necessary only to adjust the pointing head and gripping device, both of which are readily accessible. Although recommended for work not exceeding ¾-in. in diameter, the machine will



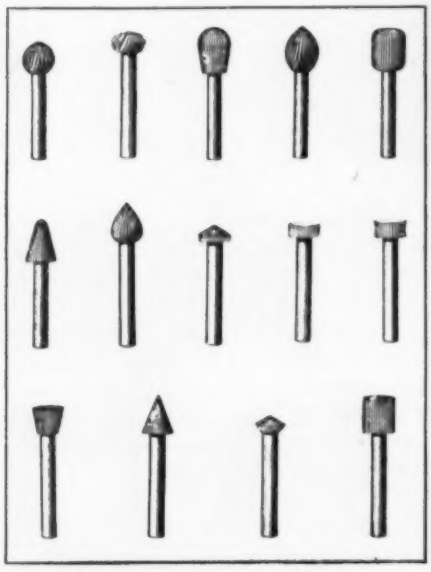
Bolts, studs, and rods from ¼ to ⅜ in. in diameter can be pointed at the rate of 1,200 to 2,400 pieces per hour on the "Economy" Type P Semi-Automatic Pointing Machine

handle 1-in. work on very short runs.

The width is 23 in.; height 41 in., length 34 in.; and the net weight, 1,400 lb. The machine requires a 1½-hp. motor running at 1,800 rev. per minute.

Keller Mill-Cut Burs

Fourteen shapes of mill-cut burs have been added to its line by the Keller Mechanical Engineering Corporation, Brooklyn, N. Y. These supplement the regular line of ¼- and ½-in., file-cut burs made of high-speed steel and the standard line of mill-cut burs. Like the others of the line they have a ¼-in. shank, and the various shapes range up to ½-in. in diameter.



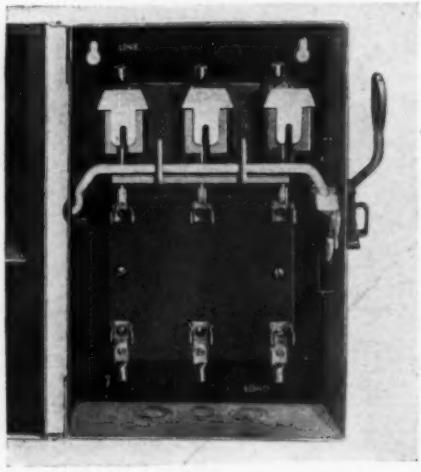
Mill-Cut Burs added by The Keller Mechanical Engineering Corporation

These burs are claimed to cut rapidly and can be used on die steels, where they leave a smooth finish. They may also be used on aluminum, brass, bronze, copper, and other soft metals without clogging.

The burs are made of one piece of steel, machined and milled between centers and ground after hardening. They are adaptable to all kinds of flexible shaft equipment, portable drills, and stationary machines.

Westinghouse Type WK-97 Safety Switches

Compact design has been achieved in the line of quick-make and quick-break Type "C" safety switches designated as the Type WK-97, announced by the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa. This compactness has been achieved without the sacrifice of ample wiring room or sufficient voltage spacings.



A positive, quick-make and quick-break mechanism is employed in the Westinghouse Type WK-97 Safety Switch

The line incorporates the "De-ion" arc quencher on the 575-volt sizes. The arc quenchers, consisting of nickel-plated, slotted steel plates are held in place by insulating holders, and are mounted individually over each jaw. They may be removed easily from the front for wiring.

In addition to these features, the crank bearings are dust-proof with grease packing; knockouts are pressed back into the box to decrease the infiltration of dirt and excessive moisture; the bases are of Monson slate; and lock-on and lock-off brackets are provided.

TRADE PUBLICATIONS

CONVEYOR CHAIN. The Transue & Williams Steel Forging Corporation, Alliance, Ohio, has issued a bulletin on its drop-forged chain, giving the special features, strength, and views of installations.

CORK MACHINERY ISOLATION. The Armstrong Cork & Insulation Co., Lancaster, Pa., has issued a bulletin "Data and Details for the Application of Armstrong's Cork Machinery Isolation," showing standard methods of insulating various types of equipment.

MILLING METHODS. The Kearney & Trecker Corporation, Milwaukee, Wis., has issued a booklet entitled "Milling Methods of the Automotive Industry," giving a large number of pictures of set-ups in various automotive plants. This bulletin is very attractively designed and the large number of pictures included furnishes a panorama of modern milling methods.

NIBBLING MACHINES. Andrew C. Campbell, Inc., Bridgeport, Conn., has published Catalog 258 concerning the classes of work which can be done with the nibbling machine, and following this with descriptions and specifications of the various types manufactured.

CATALOG OF THE HEBREW TECHNICAL INSTITUTE. The Hebrew Technical Institute, Stuyvesant & Ninth Sts., New York, N. Y., has issued its 1930 catalog. The institute trains men for the mechanical trades.

FIRST-AID SERVICE. The Policyholders Service Bureau, Metropolitan Life Insurance Co., 1 Madison Ave., New York City, has issued a booklet, "First Aid Service in Small Industrial Plants," which discusses the importance of instituting sound measures to insure the prompt and efficient care of small or "minor" injuries and also shows what industries are required by laws of the various states to make provision for first-aid treatment.

NEWS
OF THE WEEK

Industrial Machinery Exports Continue Rise—Who Will Win the Labor Portfolio?

By Paul Wooton
Washington Correspondent

AMERICAN exports of strictly industrial machinery for the first four months of 1930 reached a total value of $87,533,000, or about 4 per cent more than for the corresponding period of last year, according to the Industrial Machinery Division, Department of Commerce. Construction machinery, well and refinery machinery, and metal-working machinery largely accounted for this gain, being exported in such increased volume as to offset declines in steam engines (other than locomotives), pumping, and textile machinery.

Foreign shipments of metal-working machinery continue to show the upward tendency which has been in evidence over a considerable period. In power-driven metal-working machinery the gain for the month of April was 50 per cent and for the longer period, 22 per cent. Drilling, forging, and foundry and molding equipment has shown special activity. There was little change in shipments of other metal-working machinery, either for the month of April or for the first four months of the year.

Shipments of construction machinery continue to go abroad in increasing volume, reaching a total value of $7,357,000 for the four months of 1930, as compared with $5,431,000 for the corresponding period of last year. For the month of April this trade showed a gain of 25 per cent, as compared with March.

The trade in excavators and dredging machinery continues to show a strong upward tendency. Foreign shipments of excavators, power shovels, and parts reached a total of $4,450,000 for the four months, as compared with $3,079,000 for the 1929 period. Exports of dredging machinery and road graders were each more than doubled.

Exports of well and refinery machinery during the four months remained 25 per cent above the level of last year. Most of the gain for this period was in oil-well (other than well-drilling) machinery and in oil-refinery equipment.

The accompanying table compares exports for April, 1930, and the first four months of 1930 with the trade of the corresponding period of last year.

Beyond casual speculation on whom President Hoover will appoint to succeed James J. Davis as secretary of labor, is the question whether he will use this opportunity to place in this position a man who is capable of accomplishing much the same transformation of the Department of Labor that Mr. Hoover effected in the Department of Commerce. The act of Congress creating the Department of Labor in 1913 gives its head just as much latitude as Mr. Hoover read into the organic act of the Commerce Department; much the same condition prevails in the Labor Department now as obtained when Mr. Hoover undertook reorganization of the Commerce Department in 1921.

The labor portfolio has always been occupied by a man identified with organized labor. Whether or not Mr. Hoover follows that precedent, there is some person who is capable of obtaining and holding the co-operation of both capital and labor in a program for transforming the Department of Labor into a factor in promoting industrial progress.

By a majority vote of the Senate Judiciary Committee, the Shipstead anti-injunction bill has been referred to the Attorney General for an opinion as to its constitutionality. The committee has thus made it certain that no action will be taken on the measure during the short time remaining before adjournment.

Designed to limit the powers of federal judges in the issuance of injunctions in labor disputes, the Shipstead bill has been the subject of extensive debate since it was introduced more than two years ago. Many persons have testified before the committee that the bill if enacted would seriously interfere with the existing protection afforded industry by the courts against damages and losses growing out of labor troubles.

William Green, president of the American Federation of Labor issued the following statement after the Senate committee had voted to refer the bill. He said: "To the utter amazement of the officers and members of organized labor a majority of the members of the Senate Judiciary Committee attending a meeting today voted to refer the anti-injunction bill to the Attorney-General of the United States. Not even an obscure reason was assigned for this unprecedented action."

The Senate, for the most part, is made up of old men. It happens that they are very busy old men. Few of them had come in contact with dial telephones until they recently were installed in their offices. They reacted in a very natural way. They did not like the new-fangled contraption. The adverse reaction of the country to their resolution ordering the removal of the dial telephones makes some of them sorry that the rule, requiring committee action on resolutions before they are taken up on the floor, no longer is enforced in this day of lax leadership in the upper chamber. An amendment to the resolution, now in the offing, would leave to the discretion of each Senator the type of telephones placed in his office.

United States Exports of Industrial Machinery

Class of Machinery	April 1929	April 1930	4 Months Ended April 1929	4 Months Ended April 1930
Metal-working machinery:				
Power-driven	2,804,788	4,297,211	11,690,618	14,163,567
Other	653,790	667,651	2,555,597	2,547,276
	3,458,578	4,964,862	14,246,215	16,710,843
Power generating, except electric and automotive:				
Steam engines (1)	$464,795	$520,527	$2,760,443	$1,958,312
Internal combustion engines (2)	1,165,458	1,142,802	4,047,204	3,969,019
Water wheels and water turbines	24,463	16,081	63,213	117,278
Total	$1,654,716	$1,679,410	$6,870,860	$6,044,609
Construction and conveying machinery	2,576,803	3,169,636	3,939,354	11,015,107
Mining, oil-well and pumping machinery:				
Mining and quarrying	1,319,179	1,552,818	5,445,960	6,241,892
Well and refinery	3,119,801	2,728,651	9,060,454	11,289,655
Pumping power (3)	548,506	504,581	2,817,094	2,027,535
Total	$4,987,486	$4,786,050	$17,323,508	$19,559,082
Textile, sewing and shoe machinery:				
Textile	988,841	737,234	4,843,804	3,448,315
Sewing, industrial	279,802	348,370	1,660,002	1,475,961
Shoe	160,511	177,939	759,401	619,622
Total	$1,429,154	$1,263,543	$7,263,207	$5,543,898
Other industrial machinery (4)	7,019,251	6,680,072	29,757,371	28,659,118
Total	$21,125,988	$22,543,573	$84,400,515	$87,532,657

(1) Excludes locomotives and parts. (2) Excludes engines not over 10 h.p. (3) Excludes windmill pumps, also parts of pumps. (4) Includes mine cars.

Human needs—essential and acquired—for centuries have kept a jump ahead of production during most of the time. Analysts at the Department of Commerce see no indication of change. Production for the moment is running ahead of consumption in most lines but it never holds that place long. Heavy buying of many commodities at present suggests that the composite needs of mankind are gathering momentum.

A decrease in aeronautical exports in all classifications except that of engines is noted for April, according to the figures of the Department of Commerce. Twenty-nine engines valued at $109,324 were shipped out as compared with 19 valued at $98,958 during March. This valuation for April was approximately $30,000 less than that for April, 1929. Contrasting the four months ending with April, the 1929 period shows the exportation of 125 engines appraised at $624,140. During the same length of time in 1930, 86 engines were exported, valued at $364,985.

Exportation of airplanes, seaplanes, and other aircraft during April, 1929, was appreciably lower than during March. Eighteen planes, valued at $288,603, were shipped out during April as compared with 27 planes valued at $425,688 during March. Twenty-eight planes, worth $537,526 were exported during April, 1929. However, a comparison of the four-months periods ending with April shows that although the number of planes exported this year have dropped from 97 to 74, their export valuation has risen from $1,641,046 to $1,174,305. Aircraft parts and accessories, except tires, have risen in export valuation during the four months.

* * *

Radio Manufacturers Hold Record Meeting

All attendance records for radio trade shows were broken at the Annual Convention and Trade Show of the Radio Manufacturers' Association held at the Atlantic City Auditorium during the week of June 2. The attendance for the first three days was more than 25,000, the show being open only to manufacturers, jobbers, and dealers. About 200 manufacturers exhibited products at the Show. At the annual meeting Morris Metcalf, vice-president and treasurer of the American Bosch Magneto Corporation, was elected president of the R.M.A. Mr. Metcalf is a graduate of the Massachusetts Institute of Technology and has been previously affiliated with the Illinois Steel Co., and the International Steel Corporation.

Radio manufacturers at the Convention are quoted as believing that the slump in radio has passed. Almost a million sets have been disposed of since January 1 at "distress figures," and with the surplus off the market, and new designs coming in, the business is approaching normalcy. The new season which opens in the fall will incorporate many improvements in sets, and increased manufacturing efficiencies are expected to enable the improved sets to be sold at attractive prices. Automobile radios are expected to be in large demand.

* * *

A.S.M.E. Divisions Aid In Metal Congress Plans

The Machine Shop Practice and the Iron & Steel Divisions of the A.S.M.E. will meet in Chicago the week of Sept. 22 to co-operate with the A.S.S.T. in planning the twelfth annual National Metal Congress and Exposition.

Programs for the two divisions of the Mechanical Engineers have not yet been announced. Tentative papers to be presented at the A.S.S.T. sessions include: "Physical Properties of Fine Bolts," by H. B. Pulsifer, Ferry Cap & Set Screw Company, Cleveland; "Cemented Tungsten Carbide" by G. J. Comstock, Firth-Sterling Steel Company; and "Notes on Rustless Steel Fabrication" by J. W. McCloud and Mr. McCarrol, Ford Motor Company. A full morning session will be devoted to nitriding.

Commercial Standard Acceptances Announced

The commercial standard for standard screw threads and for special screw threads, Section I and II of the American National Screw Thread Tables for Shop Use, dated Sept. 23, 1929, and sent out under date of Jan. 23, 1930, by the U. S. Bureau of Standards for written acceptance, has been accepted by a sufficient number of manufacturers and will be effective as of July 1, 1930, for new production. A number of producers and users have followed the Reports of the National Screw Thread Commission for several years and for such organizations the effective date will indicate no change in practice.

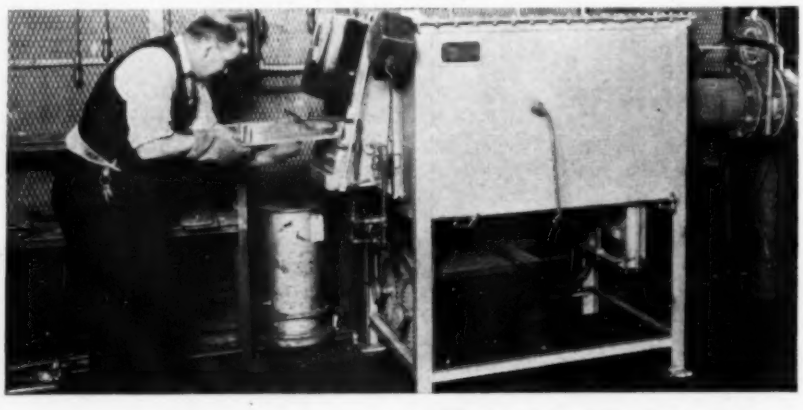
The recommended commercial standard for plain and thread plug and ring gage blanks sent out under date of March 4, 1930, for written acceptance by the U. S. Bureau of Standards, will become a commercial standard as of July 1, 1930, since a sufficient number of signed acceptances has been received.

Britain to Enter Canadian Auto Market

Canadian press dispatches from London, England, indicate that British automobile manufacturers are preparing to invade the Canadian market. They propose the establishment in Canada of assembling and manufacturing plants. This was brought out in discussion between British and Canadian delegates attending the congress of the Empire Chambers of Commerce, when what was described as United States dominance of the Canadian automobile markets was among the subjects explored.

According to the dispatches, Canadian delegates submitted three principal points:

(1) That Britain should initiate the example of the United States by providing as far as possible for manufacturing plants in Canada, and that the most effective way of meeting foreign competition in Canada was for British manufacturers to take their courage in their hands and establish plants.



A New Tool Material in Production
Loading an electric brazing furnace with tungsten carbide tools at the General Electric plant, Schenectady

(2) The necessity of having in Canada centers for assembling where organizations could be developed for the provision of spare parts.

(3) The necessity for more aggressive salesmanship.

Reporting to the conference, P. J. Hannon, the chairman of bilateral discussions, said he had received from British motor manufacturers a letter in which they said they were prepared by co-ordination and co-operation to make a really concentrated attack upon Canada through more highly organized methods of advertising and publicity.

* * *

AT A recent meeting of the Board of Directors of the American Railway Association it was decided to subscribe $15,000 per annum for three years to the American Standards Association to assist in the work of that association.

A.M.A. Production Division Meets at Cleveland

Probably the most pressing question of industry today is the problem of how to have modern management without increased unit cost of overhead, according to Thomas R. Jones, vice-president in charge of the Production Division of the American Management Association which met at the Hotel Statler, Cleveland, June 9 and 10, to discuss this topic.

"It is, of course, possible," said Mr. Jones, "to have decreased unit cost of production along with increased unit cost of overhead, the decrease in the cost of production resulting from a decrease in unit labor cost which exceeds the unit cost of overhead."

According to Mr. Jones, management has to pay attention to keeping down the unit cost of overhead, if not actually decreasing its unit cost.

The papers presented at this Conference of the Association were:

Monday, June 9

"Burden Trends in Modern Management," by N. M. Perris, partner, Stevenson, Harrison & Jordan.

"Why Have Overhead Expenses Increased—Are They Paying Their Way?" A round-table discussion of the problems suggested by Mr. Perris' paper.

"Controlling the Cost of Planning Under Various Conditions," by W. S. Richardson, Staff Superintendent, Mechanical Goods Division, The B. F. Goodrich Company.

"Controlling the Cost of Research, Design, and Development," by Roscoe Seybold, assistant to the president, Westinghouse Electric & Manufacturing Company.

"Controlling the Costs Incident to Maintaining Quality," by William H. Bray, superintendent of methods and betterments, Automatic Electric, Inc.

"How Does the Consolidation of Branch Plants or of Related Companies Affect Overhead?" by Thomas R. Jones, vice-president and general manager, Harris-Seybold-Potter Company.

Tuesday, June 10

"How Can Account Classification, Ratios and Budgets Best Contribute to Overhead Control?" by E. S. La Rose, assistant comptroller, Bausch & Lomb Optical Company.

"How Can Accounting Be Made Sufficiently Flexible for Changes in Volume?" by E. L. Lalumier, vice-president, Armour & Company.

"The Control of Indirect Production," by Wendell E. Whipp, president, Monarch Machine Tool Company.

"What Relationship Does Overhead Control Bear to Net Profits?" by Thomas J. Burke, director of cost department, American Paper & Pulp Association.

* * *

Foreign Trade Convention Largest in Ten Years

The largest convention the National Foreign Trade Council has held for the last ten years was held recently at Los Angeles with an attendance of 2,170 delegates from 31 states and 20 foreign countries and with a representation of all the foreign trade industries of the United States. The consensus of opinion by the many hundreds of foreign trade firms represented was expressed in the declaration adopted at the closing session, which stressed the point that "in precisely those lines which are directly responsive to merchandising skill and enterprise, notably in finished manufacture, whose events have not been impaired by recent events, the services of transportation and communication and our banking facilities have attained their highest point of efficiency, giving us sound reason for encouragement with regard to the future."

* * *

U. S. Steel Enters Alloy Field

The U. S. Steel Corporation, in the current issue of the *U. S. Steel Quarterly*, announces its entry, through its subsidiaries, the American Sheet & Tin Plate Co., the American Steel & Wire Co., the Carnegie Steel Co., the Illinois Steel Co., and the National Tube Co., into the stainless and heat-resistant alloy steel field. Chromium is the element about which the present activity revolves, and there are now two classes of alloys in course of production, the straight chromium steels and the chromium-nickel steels.

* * *

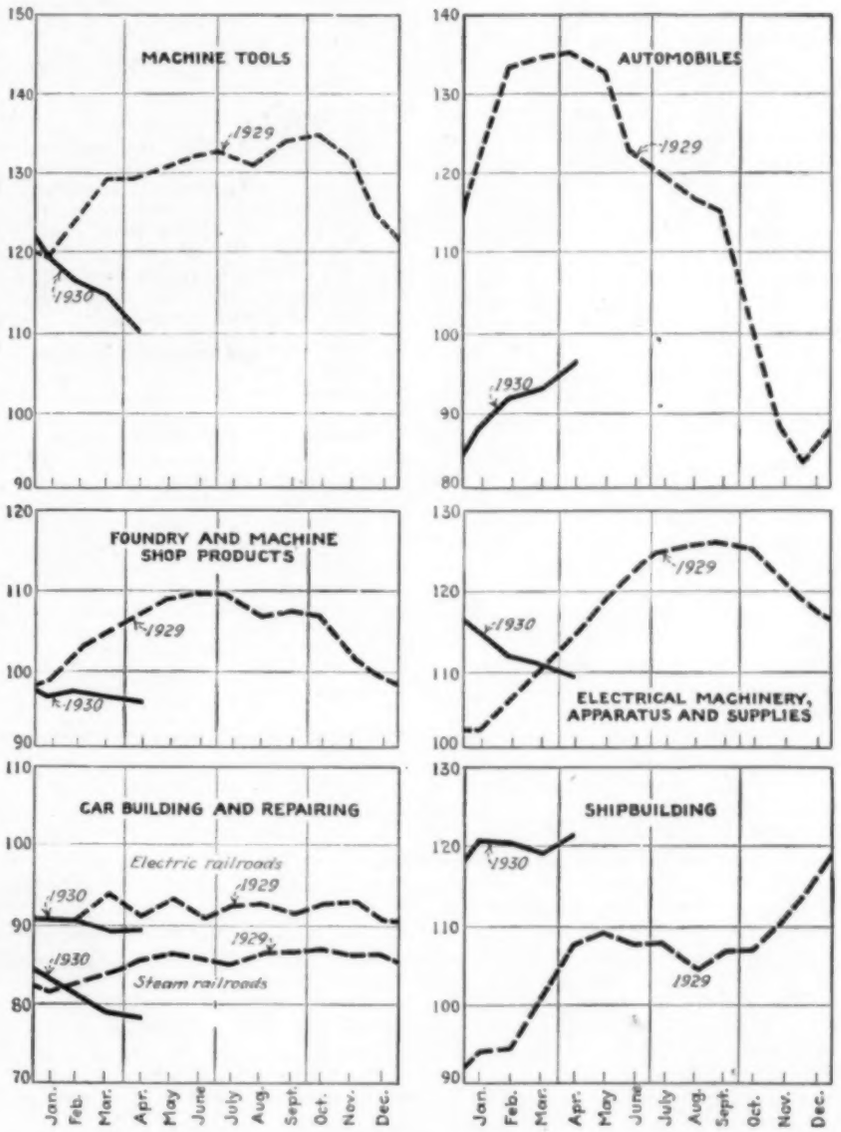
REVISED Simplified Practice Recommendation No. 90 on Hack-Saw Blades is now in printed form. Copies may be obtained from the Superintendent of Documents, Government Printing Office.

* * * *

Trend of Employment in the Metal-Working Industries

Data Supplied by the Bureau of Labor Statistics

Monthly average for 1926 = 100



BUSINESS · BAROMETER

"Last year was a time for caution; this year is a time for courage," seems to be a sound business slogan

By THEODORE H. PRICE
Editor, Commerce and Finance, New York

IN A recent speech delivered at Atlantic City, N. J., Ambassador Morrow said "last year was a time for caution; this year is a time for courage." We commend this declaration to America's business men. We believe that it is sound, and are confident that those who act upon it will not be sorry.

This we say despite the poor visibility that obscures the horizon of business at present. Seemingly, it is due to disappointment felt because President Hoover has not been able to evoke prosperity by edict. Such power would, however, imply the existence of a dictatorship, and fortunately or unfortunately it is not vested in the President nor any other official of our Government. We must wait for time to work the remedy, but it is gratifying to note the progress that is being made in the use of business therapeutics.

Chain stores and mail-order houses are commencing to show a slight increase over last year in sales. Some price-cutting is to be discerned but it is not general or drastic as yet, and most of the merchants interviewed say that stocks are so small that it is unnecessary to force their distribution. They look for a good summer trade.

Possibly the decline in railroad earnings is the most serious feature of the situation. Gross income has recently shown a decrease averaging 10 to 12 per cent. This was in excess of anticipation, but the net shows a reduction of more than 30 per cent. To get the railroad industry back in balance a reduction in expenses or a gain in gross earnings is, of course, necessary. The latter is much to be preferred as any attempt to lower wages would probably be resisted by the strong labor unions to which most of the railway employees belong.

The decline in silver, which carried the London price down to 15⅛ pence per ounce, is another feature which is unfavorably construed. It is probably due to the war in China and the unsettlement in India, but any further decline promises to be slow, and at the American price of 34 cents an ounce the production of silver will probably be much curtailed.

These two items, the railroad net earnings and the drop in silver, are the only affirmatively depressing facts that were brought to the front last week. As against them it is to be noted that the commodity markets are becoming more and more sensitive to bullish influences and that they advanced more readily than they declined.

On the New York Stock Exchange and the other stock exchanges of the country, business has been comparatively quiet. It has, however, been easier to advance than to depress stocks and with money at 3 per cent, higher prices would probably be seen if there were anything to excite speculation. Bonds are, of course, firmer with the decline in money rates, and it is not expected that the Government will have any trouble in putting out an issue of short-time certificates on a 3 per cent basis.

Overproduction is still complained of in several departments of American industry. The Ford Company has reduced the price of its cars slightly, thereby putting its competitors at a further disadvantage. It is expected that automobile production during the summer will fall off from present levels.

The steel industry is a little less active than it was last week. Nothing has occurred to stimulate it or to widen the margin between the price of the raw material and the finished product. Similar conditions are said to exist in a few other industries, including particularly the boot and shoe business and the furniture trade, where buying seems to have been checked by the speculative losses incurred by many who had intended to purchase parlor or bedroom sets this spring.

The building industry is picking up, but the increased activity is due chiefly to the public work that has been contracted for since the beginning of the year.

All these things are but incidents in the industrial life of this country. It is impossible to believe that there is any widespread economic distress unless it be among the farmers in whose behalf the United States is now attempting to set aside the law of supply and demand. This attempt may be successful for a time, and it may even be successful permanently if some way to control the agricultural production of this and other countries can be found.

Such an idea would seem to be a Utopian dream, but it was realized during the war, and it is quite possible that it may again be feasible. Those who laugh at the suggestion are referred to the ridicule that was heaped upon the first railroad builders who predicted that a train could be run at the rate of 20 miles an hour.

We are indeed in a new era, but it is an era of new inventions in the economic as well as in the industrial machinery of the world. If the Government can show that it will be able to guarantee the farmer a fair price for the fruit of his toil we shall see unprecedented prosperity in the United States.

Failure to achieve this difficult task will be followed by a reaction, but at present prices for commodities this reaction will not be ruinous.

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From this page the reader will get a quick picture of current business and industry. The boxed material below is a summary of the letters from regional correspondents of the American Machinist, published in full on the opposite page.

INERTNESS characterizes the machinery and machine-tool markets of the country at the present time, although some districts expect betterment momentarily. The general opinion places the upturn toward fall or early winter, with little change in the situation until that time. Prices are holding steady. Deliveries are immediate on stock items and 6 to 14 weeks on special tools.

NEW YORK sales totals are low, and inquiry is light. The Southern District reports betterment resulting from miscellaneous purchases. Chicago dealers sold a few tools to railroads, but the market is otherwise quiet. Detroit purchasers are less interested than they have been for years, increased automobile production notwithstanding.

CINCINNATI considers business sluggish, with sales holding about even. The Canadian market is comparatively quiet, but the future is promising. Indianapolis business is spotty, with a few dealers making sales records, a few others reporting fair sales. New England expects to remain on the present level throughout the summer, which though low, is not stagnant by any means. Dealers in all sections are agreed that business has steadied itself considerably within the past few weeks, and that future prospects hold more than one bright spot.

THE INDUSTRIAL REVIEW

Weekly progress of the machinery and machine-tool business

THE following reports, gathered from the various machinery and machine-tool centers of the country, indicate the trend of business in these countries and what may be expected from the future:

NEW YORK

Lingering memories of the preceding week's vacation period, coupled with unseasonably hot weather, seem to have played havoc with New York's machinery and machine-tool market again last week. The sales totals, which showed rises during January, February, and March, fell off during April and May, and June is expected to be just another summer month. The only purchases worth mention during the week were two lathes for the New York Central, two tools for the D. & H., and a few other items. The Federal Government has also been buying a few tools, including a pair of combination milling machines. Export demand continues, but very, very little of it is placed with New York dealers. Prices are unchanged, deliveries are good, but the market is missing.

Inquiries are also light. The General Electric inquired for two single machines during the week. No other lists appeared or are in prospect. The used tool market is quiet.

SOUTHERN DISTRICT

Betterment of the tone in the machinery and machine-tool market for this district continued the past fortnight. While there has been no pronounced upward trend in sales or no evidence of concentrated buying by any single industry, scattered orders are keeping the volume at a satisfactory level. With a generally satisfactory condition prevailing throughout the area, some improvement in the Birmingham area is noted. Houston and other points in Texas continue the best buying sources, while sales in the New Orleans district are not quite satisfactory. Quietness characterized the Gulf Coast markets; and, although active, there is comparatively little inquiry from the Monroe oil district.

Power plants and miscellaneous industrials are, for the most part, contributors to the buying. The railroads have made hardly any inquiry the past fortnight, and shipyards are reported to be quiet. Some buying by the rice mills is anticipated, but this may not mature for some weeks.

Deliveries continue satisfactory, and there has been no decline in the prices of new and used machinery and machine-tools. There appears, however, a slight surplus of used equipment.

CHICAGO

Business in machine tools during the last week, while showing no definite improvement, has been rendered somewhat less monotonous for a few machinery houses by the closing of sales on tools on which they had submitted figures. Among those who closed was the Union Pacific Railroad, which now practically has completed its buying for the present. No lists of any importance have been received by the trade, scattered inquiries for single tools or an occasional small lot being the only signs of activity reported. The Caterpillar Tractor Co., Peoria, Ill., is said to be contemplating entering the market later on for equipment to be needed for enlarged production purposes. There is reported to be on hand among dealers in used tools an exceptionally large stock of machine shop equipment which they are endeavoring to find a market for without much success. One dealer, who specializes in this class of tools, informed the writer that out of about 2,000 circulars mailed to highly rated industrialists in several states, only three inquiries were received. This reflects the general condition of the used tool market. Another house, handling both new and used equipment, said that their business was less than normal for the season by 35 per cent. No predictions are made as to the near future.

DETROIT

The machinery and machine-tool trade in the Detroit industrial area is more depressed than it has been in a great many years. Sales have been poor for the past seven months, and there has been a noticeable decline within the last six weeks or two months. Business is at a lower ebb than it has ever been before, according to the reports of some of the most representative dealers.

Most of the dealers still employ their full staffs, and nearly all of them are putting forth more effort than they do in normal times. Some small orders are being received, but they are irregular and of very little importance. Some dealers are convinced that there will be no improvement here this year, while others are of the opinion that July and August will mark the beginning of an upward trend.

Automobile and accessory manufacturers are going forward with production plans and some of them are fairly prosperous. They are not making any purchases, however, and they do not indicate that they will be in the market for equipment in the near future.

General business conditions appear to be poor. The small plants are mostly idle, but the steel business is improving rapidly, usually a healthy sign.

CINCINNATI

Taking the machine-tool industry of the Cincinnati district as a whole, business was very sluggish last week. A very few manufacturers made a slight gain and the remainder find at least a small measure of consolation in the fact that there was no further recession. The general expectancy is that the demand will not reach a lower point, but that it will stay practically as it is for a while, after which it will gradually increase.

Among the week's orders were a few that called for two or three pieces of equipment, but in most cases the requirements were confined to single tools and replacements. The business was well diversified as to sizes and types of tools and it was well scattered over the different sections of the country. The principal buyers were general machinists and miscellaneous users, but some scattered buying was done by railroads and by concerns in the automotive industry.

CANADA

The machinery and machine-tool market in Canada has been comparatively quiet during the last fortnight. Orders have been fairly steady, but the volume has not been nearly as heavy as during the first two weeks in May. Nevertheless, the outlook for future business is promising. Employment is at a decidedly higher level than it was a month ago and general industrial conditions are slowly improving. Car-building plants are still well employed, and there is a considerable volume in sight for structural steel plants. Automobile output during April at 24,257 cars was well under the 41,901 cars produced in April of a year ago, but compares favorably with the totals of 24,211 cars in April, 1928, and 24,611 cars in April, 1927.

Manufacturers of road-building machinery will benefit by the program of highway construction to be carried out this summer. It is estimated that approximately $57,200,000 will be spent by the various provincial Governments on highway construction and maintenance. In addition there will be an expenditure of at least $30,000,000 by various counties and townships, making a grand total of over $87,000,000 to be spent within the next few months.

Manufacturers of hydraulic machinery have been consistently well employed since the beginning of the year and there is still a good volume of business in sight.

INDIANAPOLIS

Inquiry as to business conditions among the various manufacturers and dealers of machine tools here reveals a wide variety of opinions. In some instances the manufacturers, particularly, report a good demand. In fact, one manufacturer declared business had been better during the first five months of this year than for some years past. It hardly seems creditable, but this was his statement. And he was not alone, for another big manufacturer also reports a good business. Some dealers also report a fair business.

The bulk of the trade, however, reports sales scarce and money hard to collect. The general impression, however, is for better business as fall approaches. Just now there is a fair demand for small tools for the garage and small machine shop trade. The automobile demand is very poor and there are no indications of any big resumption of business at the factories in this area.

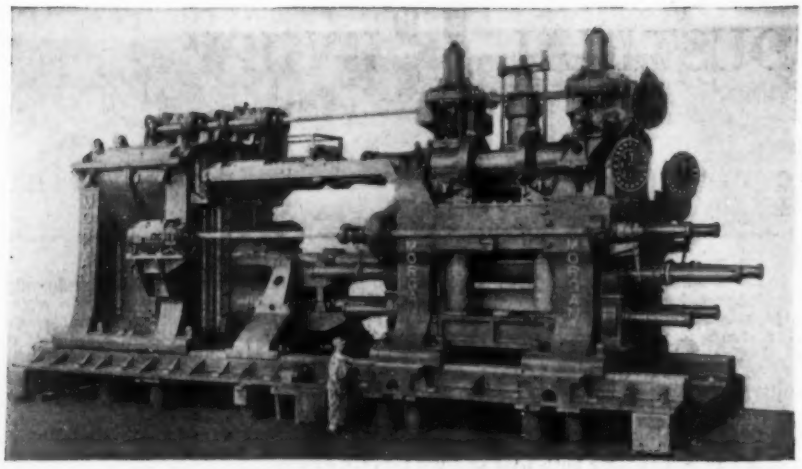
Perhaps the one bright spot in the trade comes from the airplane industry. Not only are plane factories calling for tools, but the demand for repair equipment at the numerous airports that have sprung up like mushrooms during the past few months is increasing steadily. There also is a good demand for tools from the radio industry in Indiana, most of the larger factories working steadily.

NEW ENGLAND

Indications in the New England territory point to a continuation of the present level of business, probably throughout the summer months. Executives voice little optimism for an increase in order volume before fall. Industrial conditions are unsettled with many companies complaining of a good volume of orders with a hold-up tag. A large Massachusetts electrical manufacturing company has adopted a 5-day schedule.

Inquiries have ceased to be a correct barometer by which actual machine-tool business may be judged. While not as numerous, inquiries average far above orders placed. The week included some good orders for presses and small automatics, the former for a Middle West company.

Lathes are selling fairly steady and with grinders lead in the demand. The situation in the latter field indicates less activity than a month ago because of declines in foreign demand.



Built by The Morgan Engineering Co., for the new $12,000,000 A. M. Byers plant at Economy, Pa., this 46-in. high universal plate mill has a maximum height of 20 ft. 9 in., and a length of 53 ft. 7½ in. from the center of the 4,000-hp. motor to the center of the mill, which will roll 84-in. sheared plate

Business Items

The Ames Shovel Works, Anderson, Ind., is operating full time with a large force of employees, in the new temporary assembly plant. Rapid progress is being made in the construction of the large new assembly department building, to replace the old building, destroyed by fire some time ago.

Construction of a $250,000 addition to the plant of the General Motors Truck Co. on South Boulevard, Pontiac, Mich., was begun on May 26. The building will be used for engineering and warehouse purposes. An additional quarter-million dollar investment is expected to be necessary to equip it.

At the regular quarterly meeting of the Board of Directors of the Chicago Pneumatic Tool Co., held June 3 at the company's offices, Chicago Pneumatic Bldg., 6 East 44th St., New York City, W. L. Lewis, formerly assistant comptroller of the Bethlehem Steel Corporation, was elected vice-president, secretary, and treasurer, succeeding J. G. Grimshaw, secretary and treasurer, resigned.

The Electric Machinery Manufacturing Co., Minneapolis, Minn., will have exhibit spaces 88 and 108 at the Iron & Steel Exposition to be held in Buffalo from June 16-20. Representatives at the Exposition will include W. H. Feldmann, C. E. Buchan, H. T. Thompson, E. T. Pet-ick, and G. W. Burnes.

The Chicago Pneumatic Tool Co., New York City, has acquired the Cochise Rock Drill Manufacturing Co., Los Angeles, according to a recent announcement. The consideration was reported to be about $1,000,000. Plans for the Los Angeles company include the doubling of the present force.

The Suspension Bearing Co., Inc., Spartanburg, S. C., has elected the following officers: Isaac Andrews, president, A. J. R. Helmus, treasurer, and H. O. Coddington, vice-president and general manager.

Fairchild Aircraft, Ltd., is now manufacturing its own planes in Canada. The new plant near Longueil, Quebec, has been completed, and production has been started.

Personals

W. L. Abbott, chief operating engineer of the Commonwealth Edison Co., and past-president of the A.S.M.E., is one of the leading personalities in the organization of the new Chicago Bank of Commerce.

Guiseppe Faccioli, associate manager and chief consulting engineer, Pittsfield (Mass) works of the General Electric Co., Schenectady, N. Y., has resigned his position, because of ill health, after 25 years with the company.

Ernest G. Opie has severed his connection with the Ramsey Chain Co., Inc., Albany, N. Y., and has become associated with the Bailey-Burruss Manufacturing Co., Atlanta, Ga., as plant manager and chief engineer.

Grant K. Palsgrove, professor of hydraulic engineering at Rensselaer Polytechnic Institute, was recently elected president of the Society of Engineers of Eastern New York for 1930-1931.

G. E. J. Pistor of the Hay Foundry & Iron Works, New York City, treasurer of the American Institute of Steel Construction, will sail from New York City on July 3 for Europe where he is scheduled to address several meetings of fabricators. Mr. Pistor will return to this country some time in September.

Frank H. Prouty, Prouty Bros. Engineering Co., Denver, was recently elected president of the Colorado Section of the A.S.M.E. Arthur Halliwell, assistant superintendent, General Iron Works Co., of the same city, was elected secretary-treasurer.

A. A. Ross of the General Electric Co., Schenectady, N. Y., was unanimously elected chairman of the General Standardization Committee of the American Gear Manufacturers' Association recently, to succeed B. F. Waterman, new president of the Association. Mr. Ross was formerly chairman of the Herringbone Gear Committee.

Frederick Henry Royce, founder, director and chief engineer of Rolls-Royce, Ltd., who designed the engines of the Supermarine S-6, in which Flight Lieut. Waghorn won the Schneider Cup last summer, received a baronetcy as one of the rewards in King George V's recent "birthday honors" list.

Heyman Rosenberg, vice-president of the Parker-Kalon Corporation, New York City, was among the engineers honored by the Franklin Institute of

Bachrach Photo

Philadelphia at a recent meeting. Mr. Rosenberg was awarded the Institute's Certificate of Merit for his development of hardened self-tapping screws.

Hayden B. Russell has been appointed sales representative of the Modern Tool Works Division of the Consolidated Machine Tool Corporation of America, Rochester, N. Y., in the Metropolitan district with headquarters at 150 Broadway, New York City. He was formerly associated with the Carboloy Co. and the Speakman Co. in similar capacities.

Arthur W. Taylor, plant manager of the Page Steel & Wire Co., Monessen, Pa., has retired effective June 1, and will be succeeded by C. N. Johns, formerly Mr. Taylor's assistant.

W. M. Taylor was re-elected chairman of the Indianapolis Section, A.S.M.E., at a recent meeting. Other officers also re-elected, included L. V. Ludy of Lafayette, Ind., who is vice-chairman; Homer Rupard, secretary, H. O. Garman and M. R. Edwards, executive committee members.

C. V. Smith, connected with the Chase Co. Division of the Kennecott Copper Corporation for the past 12 years, recently opened an office in New York City as an independent consultant on industrial and metallurgical heating operations, furnaces, and fuels.

J. D. Stout, who has been associated with the Terry Steam Turbine Co.,

Hartford, Conn., since 1909 and for the past two years manager of the New York office, has been elected vice-president with headquarters in Hartford.

Edward N. Trump has resigned from the Solvay Process Co., with which he has been connected for 48 years in engineering, managerial, and executive capacities. Upon his return from the World Power Conference, Mr. Trump will open offices, in Syracuse, N. Y., as a consulting mechanical and chemical engineer.

R. E. White, connected for the past 20 years with the Northwest Aircraft & Motor Corporation as engineer and executive, has been appointed treasurer.

Obituaries

Adolph A. Claus, president of the Erie (Pa.) Manufacturing Corporation, and treasurer of the Heisler Locomotive Works, Erie, Pa., died recently at his summer home on Lake Erie, following a lingering illness. He had been prominently identified with industrial life in northwestern Pennsylvania for 20 years.

Coker F. Clarkson, 60, secretary and general manager of the Society of Automotive Engineers for the past 20 years, died on June 4 of heart disease at his home, Sleepy Hollow Farm, Scarborough-on-Hudson.

Mr. Clarkson's untiring and self-sacrificing work for the S.A.E. and his ability to guide its activities with harmony through two decades of changing officers and changing conditions have

often been the subject of favorable comment by members of the Society he served so well. They were formally recognized in resolutions passed at the recent 25th Anniversary meeting.

Frank H. Truax, 58, a director of the Simmons Co., Kenosha, Wis., and New York City, and manager of the traffic and service division, died at his home in New York City on May 28. He entered the service of the Simmons Co. at Kenosha in 1905.

Charles M. Ams, 63, president of the Max Ams Co., Bridgeport, Conn., died on May 26 at his home in Pelham, N. Y. Mr. Ams was the first to conceive and manufacture the "sanitary tin can" sealed with crimped edges rather than with solder.

Albert K. Spencer, 64, treasurer of the Wood & Spencer Co., Cleveland, and vice-president of the Cleveland Castings Pattern Co., died at his home in that city on May 22.

William G. Gordon, mechanical and electrical engineer, associated with the Canadian General Electric Co., and president of the Engineers' Club in Toronto, died in that city on May 14, following a short illness.

Sidney A. Keller, 57, treasurer and one of the founders of the Keller Mechanical Engineering Corporation,

Brooklyn, N. Y., died at his home in Woodmere, L. I., on June 4. He had been a member of the firm since its founding in 1896.

Francis Augusta Shea, 70, president of the Reece Buttonhole Machine Co., Boston, Mass., since 1896, died May 29 at his summer home at Littles Point, Swampscott, Mass., following a brief illness.

George Merryweather, of the Motch & Merryweather Machinery Co., Cleveland, died suddenly on June 8 in that city. At the time of going to press, further information was not available.

F. E. Satterlee, president of the F. E. Satterlee Co., Minneapolis, Minn., died on May 24.

Edwin C. Bruning, vice-president of the Charles Bruning Co., Inc., New York City, died on May 25.

Forthcoming Meetings

NATIONAL ASSOCIATION OF PURCHASING AGENTS—Fifteenth annual convention, Stevens Hotel, Chicago, June 16-19. "Inform - A - Show" in conjunction. G. A. Renard, 11 Park Place, New York City, is secretary-treasurer.

STEEL INDUSTRY'S EXECUTIVES—Annual Iron & Steel Exposition. Under the sponsorship of the Iron & Steel Electrical Engineers, June 16-20, Broadway Auditorium, Buffalo, N. Y. John F. Kelly, 1010 Empire Bldg., Pittsburgh, Pa., is managing director.

WORLD POWER CONFERENCE—Second annual conference, Berlin, Germany, June 16-25. O. C. Merrill, Edmonds Bldg., Washington, is U. S. chairman.

AMERICAN SOCIETY FOR TESTING MATERIALS—Annual meeting, Haddon Hall, Atlantic City, N. J. June 23-27. C. L. Warwick, 1315 Spruce Street, Philadelphia, is secretary-treasurer.

STEEL FOUNDERS' SOCIETY OF AMERICA—Semi-annual convention, Greenbrier Hotel, White Sulphur Springs, Va., June 26-27. G. P. Rogers, 932 Graybar Bldg., New York City, is managing director.

SOCIETY FOR THE PROMOTION OF ENGINEERING EDUCATION—Annual convention, Montreal, Que., Canada, from June 26-28. F. L. Bishop, University of Pittsburgh, Pittsburgh, Pa., is secretary.

INTERNATIONAL CONGRESS FOR GENERAL MECHANICS — Liege, Belgium, Aug. 31 to Sept. 7. For information address Alb. Schlag, 4 Place Saint Lumbert, Liege, Belgium.

NATIONAL METAL CONGRESS—Twelfth annual Congress and Exposition, Stevens Hotel, Chicago, Sept 22-26. W. H. Eisenman, secretary of the A.S.S.T., 7016 Euclid Ave., Cleveland, Ohio, is director.

AMERICAN WELDING SOCIETY—Annual fall meeting, Congress Hotel, Chicago, September 22-26. W. M. Spraragen, 29 W. 39th St., New York, N. Y. is technical secretary.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS—Annual fall meeting of Iron & Steel Division and Machine Shop Practice Division, Stevens Hotel, Chicago, September 22-26. P. T. Wetter, 29 W. 39th St., New York, secretary.

AMERICAN INSTITUTE OF MINING & METALLURGICAL ENGINEERS — Annual fall meeting of Iron & Steel Division, Stevens Hotel, Chicago, September 22-26. T. T. Read, 29 W. 39th St., New York, N. Y., is secretary.

AMERICAN INSTITUTE OF MINING & METALLURGICAL ENGINEERS — Annual fall meeting of the Institute of Metals Division, Stevens Hotel, Chicago, September 22-26. W. M. Corse, 29 W. 39th St., New York, N. Y., is secretary.

AMERICAN SOCIETY FOR STEEL TREATING—Annual Convention, Stevens Hotel, Chicago, September 22-26. W. H. Eisenman, 7016 Euclid Ave., Cleveland.

NATIONAL SAFETY CONGRESS—Nineteenth Annual, to be held at Fort Pitt and William Penn Hotels, Pittsburgh, from Sept. 29 to Oct. 3. Metals Section meetings will be held on Tuesday and Wednesday mornings and Thursday afternoon.

AMERICAN GEAR MANUFACTURERS' ASSOCIATION — Semi-Annual meeting, Hotel Clifton, Niagara Falls, Ont., Canada, from Sept. 29 to Oct. 1.

THE WEEKLY PRICE GUIDE . . .

Rise and Fall of the Market

TWO favorable factors have made their appearance in the market developments of the week, namely, a rise of 50c. per ton, to $15, in heavy melting scrap at Pittsburgh and some show of firmness in semi-finished steel. The upturn in scrap, though slight, probably marks the end of a protracted decline in this material. Consumption is active in ship and tank plates and material for natural-gas pipe lines. Other departments of the steel and iron trade are markedly dull for so early in the season. Declines became effective this week in steel sheets, Pittsburgh; cold-finished steel, Chicago; tin and cutting oil, New York. For two weeks in succession there have been no advances in materials listed here.

(*All prices as of June 6, 1930*)

IRON AND STEEL

PIG IRON—Per gross ton, f.o.b.:

CINCINNATI	
No. 2 Southern (silicon 1.75@2.25)	$16.69@$18.19
Northern Basic	19.89@ 20.39
Southern Ohio No. 2	19.89@ 20.39
NEW YORK—Tidewater Delivery	
No. 2 Southern (silicon 1.75@2.25)	18.00@ 18.50
BIRMINGHAM	
No. 2 Foundry (silicon 1.75@2.25)	14.00
PHILADELPHIA	
Eastern Pa., No. 2x (silicon 2.25@2.75)	20.00
Virginia No. 2	18.75@ 19.25
Basic	22.29
CHICAGO	
No. 2 Foundry, local (silicon 1.75@2.25)	19.00
No. 2 Foundry, Southern (silicon 1.75@2.25)	18.20
PITTSBURGH, including freight charge ($1.76) from Valley:	
No. 2 Foundry	19.63@ 20.13
Basic	19.63@ 20.13
Bessemer	20.76

IRON MACHINERY CASTINGS—Cost in cents per lb. of 100 flywheels, 6-in. face x 24-in. dia., hub not cored, good quality gray iron, weight 275 lb.:

Detroit	4.50
Cleveland	5.00
Cincinnati	4.50
New York	5.25
Chicago	4.50@4.75

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the mill base in large lots:

Blue Annealed*	Pittsburgh Mill Base	Chicago	Cleveland	New York
No. 10	1.80@2.10	3.35†	3.25	3.50@3.60†
No. 12	1.85@2.15	3.45†	3.30	3.55@3.65†
No. 14	1.95@2.25	3.55†	3.40	3.60@3.70†
No. 16	2.05@2.35	3.65†	3.50	3.70@3.80†
Black				
Nos. 18 to 20	2.30@2.35	3.85†	3.55	3.45@3.70
No. 22	2.45@2.50	4.00†	3.70	3.60@3.85
No. 24	2.50@2.55	4.05†	3.75	3.65@3.90
No. 26	2.60@2.65	4.15†	3.85	3.75@4.00
No. 28	2.75@2.80	4.75†	4.00	3.90@4.15
Galvanized				
No. 10	2.50	3.90†	3.80	3.55@3.80
Nos. 12 to 14	2.60	4.00†	3.90	3.65@3.90
No. 16	2.70	4.10†	4.00	3.75@4.00
No. 18	2.85	4.25†	4.15	3.90@4.15
No. 20	3.00	4.40†	4.30	4.05@4.30
No. 22	3.05	4.45†	4.35	4.10@4.35
No. 24	3.20	4.60†	4.50	4.25@4.50
No. 26	3.45	4.85†	4.75	4.50@4.75
No. 28	3.70	5.10†	5.00	4.75@5.00

*Light Plates. †Up to 3,999 lb.

WELDED STEEL PIPE—Warehouse discounts are as follows:

	New York Black	New York Galv.	Cleveland Black	Cleveland Galv.	Chicago Black	Chicago Galv.
1 to 3 in. butt..	56.02%	43.48%	53.3%	42.3%	57.3%	44.8%
3½ to 6 in. lap..	52. 6%	40.06%	50.8%	37.8%	53.9%	41.4%

WROUGHT-STEEL PIPE LIST

Size, Inches	List Price per Foot	Diameter in Inches—External	Diameter in Inches—Internal	Thickness Inches
1	$0.17	1.315	1.049	.133
1¼	.23	1.66	1.38	.14
1½	.27½	1.9	1.61	.145
2	.37	2.375	2.067	.154
2½	.58½	2.875	2.469	.203
3	.76½	3.5	3.068	.216
3½	.92	4.0	3.548	.226
4	1.09	4.5	4.026	.237
5	1.48	5.563	5.047	.258
6	1.92	6.625	6.065	.28
8	2.50	8.625	8.071	.277

SEAMLESS STEEL TUBING—Following net prices are for seamless mechanical tubing, cold drawn, round, .10 to .30 carbon, at New York warehouse in lots of less than 100 ft. or 100 lb.:

Thickness—Decimal	B.w.g. and Fractions	Outside Diameter in Inches—⅛	¼	⅜	½	⅝	¾	⅞	1	1¼	1½
		Price per Foot—									
.035″	20	$0.15	$0.16	$0.17	$0.18	$0.19	$0.21	$0.23			
.049″	18	.17	.18	.19	.20	.21	.23	.25			
.065″	16	.19	.20	.21	.22	.23	.25	.27			
.083″	14	.20	.22	.23	.24	.25	.27	.29			
.095″	13	.21	.23	.25	.26	.27	.29	.31			
.109″	12	.22	.24	.26	.27	.28	.30	.32			
.120″ or .125″	11	.23	.25	.27	.28	.29	.31	.33			
.134″	10	.24	.26	.28	.29	.30	.32	.34			

MISCELLANEOUS—Warehouse base prices in cents per lb.:

	New York	Cleveland	Chicago
Spring steel, light*	4.50	4.65	4.65
Spring steel, heavier	4.00	4.00	4.00
Coppered Bessemer rods	6.05	6.00	6.20
Hoop steel	4.25†	4.00	3.75†
Cold rolled strip steel	6.25	6.00	6.10
Floor plates	5.10†	5.30	5.00†
Cold fin., round or hexagon‡	3.40	3.65	3.35
Cold fin,, flat or square‡	3.90	4.15	3.85
Structural shapes	3.30†	3.00	3.10†
Soft steel bars	3.25†	3.00	3.00†
Soft steel bar shapes	3.25†	3.00	3.00†
Soft steel bands	3.75†	3.65	3.20†
Tank plates	3.30†	3.00	3.10†
Bar iron (2.75 at mill)	3.24	3.00	3.00
Drill rod (from list)	60%	55%	50%

*Flat, ⅛-in. thick by ¾-in. wide. †Up to 3,999 lb., ordered and released for shipment at one time. ‡Cold finished steel, shafting and screw stock.

Electric welding wire at New York warehouse—$\frac{3}{32}$, 8.35c. per lb.; ⅛, 7.85c. per lb.; $\frac{5}{32}$ to ¼, 7.35c. per lb.

METALS

Warehouse Delivery Prices in Cents Per Lb. for Small Lots:

Copper, electrolytic, New York			14.50
Tin, Straits, pigs, New York			34.00@35.00
Lead, pigs, E. St. Louis	5.40	New York	6.50@ 7.00
Zinc, slabs, E. St. Louis	4.65	New York	6.25@ 7.25

	New York	Cleveland	Chicago
Antimony, slabs	10.25@10.75	10.50	11.50
Copper sheets*	22.75	22.75	22.75
Copper wire*	15.00	15.12½	15.12½
Copper, drawn, round*	21.25	21.25	21.25
Copper tubing*	25.00	25.00	25.00
Brass sheets, high*	19.75	19.75	19.75
Brass tubing, high*	24.75	24.75	24.75
Brass rods, high*	18.00	18.00	18.00
Brass wire, high*	20.25	20.25	20.25

*Mill, base.

SHOP MATERIALS AND SUPPLIES

METALS—Continued

	New York	Cleveland	Chicago
Aluminum ingots, 99%.....	25@26	24.30	24.30
Zinc sheets (casks).....	10.25@10.75	11.75	10.11
Solder (½ and ½).....	25.25	25.50	26@28

Babbitt metal, delivered in case lots, New York, cents per lb.:

Genuine, highest grade.....	51.00
Commercial genuine, intermediate grade.....	37.00
Anti-friction metal, general service.....	31.00
No. 4 babbitt, f.o.b.....	11.00

NICKEL AND MONEL METAL—Price in cents per lb., base, f.o.b. Huntington, W. Va.:

	Nickel	Monel Metal
Sheets, full finished.....	52.00	42.00
Sheets, cold rolled.....	60.00	50.00
Strip, cold rolled.....	55.00	45.00
Rods, hot rolled.....	45.00	35.00
Rods, cold drawn.....	50.00	40.00
Tubing.....	75.00*	90.00†
Angles, hot rolled.....	50.00	40.00
Plates.....	52.00	42.00

*Seamless. †Welded.

OLD METALS—Dealers' purchasing prices in cents per pound, f.o.b. cars:

	New York	Cleveland	Chicago
Crucible copper.....	10.00@10.25	10.00	9.25@ 9.75
Copper, heavy, and wire..	9.00@ 9.25	9.75	8.50@ 9.00
Copper, light, and bottoms	7.50@ 7.75	9.50	7.50@ 8.00
Heavy lead.....	4.00@ 4.12½	4.00	3.50@ 4.00
Tea lead.....	2.00@ 2.25	3.00	2.50@ 3.00
Brass, heavy, yellow....	5.00@ 5.25	6.00	5.00@ 5.50
Brass, heavy, red.....	7.50@ 7.75	8.75	7.50@ 8.00
Brass, light.....	4.00@ 4.25	5.00	4.50@ 5.00
No. 1 rod-brass turnings.	5.50@ 5.75	6.00	6.00@ 6.50
Zinc.....	2.00@ 2.25	1.25	1.75@ 2.00

TIN PLATES—Charcoal—Bright—Per box:

"AAA" Grade:	New York	Cleveland	Chicago
IC, 14x20.....	$12.10	$11.95	$11.50
"A" Grade:			
IC, 14x20.....	9.70	9.90	9.50
Coke Plates—Primes—Per box:			
100-lb., 14x20.....	6.45	6.10	7.00
Terne Plates—8-lb. Coating—Small lots—Per box:			
IC, 14x20.....	7.75@8.00	7.00	7.50

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb.....	$0.13	$0.16	$0.15
Cotton waste, colored, per lb...	.09½	.12	.12
Wiping cloths, washed, white, per lb.....	.13½	38.00 per M	.16
Sal soda, per lb.....	.01¼	.02	.02
Roll sulphur, per lb.....	.028	.03½	.04
Linseed oil, raw, in 1 to 4 bbl. lots, per lb.....	.146	.164	.15
Cutting oil, about 25% lard, in 5 gal. cans, per gal.....	.65	.60	.65
Machine oil, medium-bodied (55 gal. steel bbl.) per gal.....	.33	.36	.24
Belting—Present discounts from list in fair quantities (½ doz. rolls) for leather or rubber:			
Leather—List price, 24c. per lin.ft., per inch of width, for single ply:			
Medium grade.....	30–10%	30–10%	35%
Med. grade, heavy wgt.....	30%	30 –5%	30%
Rubber transmission, 6-in., 6 ply, $1.83 per lin.ft.:			
First grade.....	50%	50–10%	50%
Second grade.....	60%	60– 5 %	50–10%

Comparative Warehouse Prices

New York	Unit	Current Price	Four Weeks Ago	One Year Ago
Soft steel bars.....	per lb.	$0.0325	$0.0325	$0.0325
Cold drawn shafting..	per lb.	.034	.034	.035
Brass rods.....	per lb.	.18	.1875	.2125
Solder (½ and ½).....	per lb.	.2525	.2625	.32
Cotton waste, white..	per lb.	.13	.13	.10@.13½
Disks, aluminumoxide mineral, cloth, No. 1 6-in. dia.....	per 100	4.59	4.59	3.60
Lard cutting oil.....	per gal.	.65	.75	.55
Machine oil.....	per gal.	.33	.33	.33
Belting, leather, medium.....	off list	30–10%	30–10%	30–10%
Machine bolts, up to 1x30 in., full kegs....	off list	50–10%*	50–10%*	50–10%*

*List prices as of April 1, 1927

MISCELLANEOUS—Continued

	New York	Cleveland	Chicago
Abrasive materials — Standard grade, in sheets 9x11 in., No. 1, per ream of 480 sheets:			
Flint paper*.....	$6.03	$6.03	$6.03
Emery cloth*.....	25.87	25.87	25.87
Disks, aluminum oxide mineral, 6 in. dia., No. 1, per 100:			
Paper†.....	2.61	2.61	2.61
Cloth†.....	4.59	4.59	4.59
Fire clay, per 100 lb. bag.....	1.00	.75	.75
Coke, prompt furnace, per net ton....	Connellsville,		2.50
Coke, prompt foundry, per net ton....	Connellsville,		3.50@4.85
White lead, dry.....	100 lb. kegs...	New York,	13.75
White lead, in oil.....	100 lb. kegs...	New York,	14.25
Red lead, dry.....	100 lb. kegs...	New York,	13.75
Red lead, in oil.....	100 lb. kegs...	New York,	15.25

*Less than 3 reams. †Less than 200.

SHOP SUPPLIES

Discounts from new list dated Apr. 1, 1927, applying on immediate deliveries from warehouse stocks in New York and vicinity:

Machine bolts:	
Up to ¾-in. x 6-in., full kegs, list less.....	60%
Larger, up to 1 x 30-in., full kegs, list less.....	50–10%
Less than full kegs or case lots, add to list.....	10%
Fitting-up bolts: list less.....	45%
Lag screws:	
Up to ½-in. x 6-in., list less.....	60%
Larger, list less.....	50–10%
Less than full keg or case lots, add to list.....	10%
Rivets:	
Structural, round head, full kegs, net.....	$4.50
Structural, round head, broken kegs, net.....	6.00
Tank, $\frac{7}{16}$-in. dia. and smaller, list less.....	60%
Nuts:	
Hot pressed, square or hexagonal, blank or tapped:	
Full kegs up to 1-in., incl., list less.....	60%
Larger, up to 3-in., list less.....	40–10%
Less than keg or case lots, add to list.....	10%
Washers:	
Wrought, full kegs, per 100 lb., list less.....	$4.00
Wrought, broken kegs, per 100 lb., list less.....	2.00
Turnbuckles:	
With stub ends, list less.....	20%
Without stub ends, list less.....	50%
Chain:	
Proof coil, base, per 100 lb., net.....	$8.50
Cast iron welding flux, per lb., net.....	.35
Bronzing flux, per lb., net.....	.50

MACHINE REQUIREMENTS AND INDUSTRIAL CONSTRUCTION

Equipment Wanted

Conn., Winsted—Winsted Insulated Wire Co. —wire drawing machinery. Cost $100,000 to $200,000.

N. Y., Tarrytown—Fisher Body Corp., General Motors Bldg., Detroit, Mich.—machinery and equipment for proposed addition to automobile body plant.

O., Cleveland—Gabriel Mfg. Co., 1407 East 40th St. (shock absorbers)—2 spindle ⅞ in. cap. high speed drill with power feed to spindle.

Ont., Hamilton—Consumers Lumber Co., G. Lon, Mgr., Wentworth St.—interested prices complete new equipment to replace fire loss.

Ont., London — Canadian Richards Wilcox Co., W. R. Yendall, Mgr. — machinery and equipment for the manufacture of small lines of hardware specialties, garage door equipment, etc., for proposed addition to factory on Adelaide St. $40,000.

Ont., Tobermory—T. Spears—interested in prices complete equipment for sawmill to replace fire loss. $15,000.

Ont., Walkerville — Dominion Specialties Corp., L. Newham, Mgr.—interested in prices on complete equipment for machinery and plating plant destroyed by fire. Loss $100,000.

Ont., Walkerville — Universal Fastening & Button Co.—interested in prices complete equipment to replace fire loss $250,000.

Opportunities for Future Business

D. C., Washington—O. J. Maigne Co., 356 Pearl St., New York, N. Y., is having sketches made for the construction of a plant for the manufacture of printers rolls on George Ave. Estimated cost to exceed $100,000. Dodge & Morrison, 160 Pearl St., Archts.

Ill., South Chicago—Illinois Steel Co., will build a 1 story mill motor and spare storage building at 8043 Brandon Ave., also 1 story soaking pit building at 8101 Brandon Ave. Estimated total cost $1,045,000.

Ind., Evansville — Atlas Box Co., awarded contract for the construction of a factory at 932 East Pennsylvania St. Estimated cost $47,000.

Ind., Fort Wayne — International Harvester Co., 606 South Michigan Ave., Chicago, Ill., is having plans prepared for a 60 x 100 ft. addition to factory here. Estimated cost $50,000.

Ind., Greentown—Mid-Western Co., awarded contract for the construction of a machine shop and service station in Hamilton Co. here. Estimated cost $41,000.

Ind., Hammond — P. W. Meyn, is having plans prepared for the construction of a service station at State and Calumet Sts. Estimated cost $43,000. L. C. Hess, Hammond, Archt.

Ind., Marion—A. J. Davis, awarded contract for the construction of a 66 x 132 ft. machine shop and service station on South Washington St. Estimated cost $45,000.

Ind., Marion—U. S. Radio Co., awarded contract for a 100 x 300 ft. factory on South Adams St. Estimated cost $46,000.

Ind., Richmond—Campbell Sales Co., awarded contract for a 60 x 130 ft. machine shop and garage on South 8th St. Estimated cost $40,000.

Iowa—D. W. Burch, Maintenance Supt., 339 Old Masonic Temple, Davenport, will receive bids until June 19 for the construction of a 1 story 34 x 89 ft. garage building at Tipton and 1 story, 34 x 96 ft. garage building at Muscatine.

Mass., Cambridge (Boston P. O.) — G. Kramer, 844 Main St., will soon receive bids for the construction of a 3 story garage at 1725 Massachusetts Ave. Estimated cost $200,000. E. T. P. Graham, 171 Newbury St., Boston, Archt. Noted May 15.

Mass., Fall River—Firestone Tire & Rubber Co., South Main St., Akron, O., plans the construction of a service station. Estimated cost $50,000. Private plans.

Mass., North Attleboro—I. H. Linley, 391 Broadway, awarded contract for the construction of a 2 story service station. Estimated cost $40,000. Firestone Tire & Rubber Co., South Main St., Akron, O., lessee.

N. J., Elizabeth—J. Skramovsky, 51 Dayton St., will not construct 1 story, 50 x 100 ft. work shop at 10-12 South Spring St. Estimated cost $40,000. J. B. Beatty, 15 North Reid St., Archt. Noted May 29.

N. J., Fort Lee—G. W. Dexter, 201 Main St., Archt., will receive bids about July 1 for a 1 story, 25 x 240 ft. machine shop and 20 x 200 ft. shipping building for Consolidated Film Industries Inc., Lemoine Ave. Estimated cost $75,000. Noted June 5.

N. J., Jersey City—B. Singer, 921 Bergen Ave., Archt., will receive bids about July 1 for a 2 story, 45 x 140 ft. factory on Crawford St. for Jersey City Ladder Co., Inc., 677 Montgomery St. Estimated cost $40,000. Noted June 5.

N. J., Lakehurst—Bureau of Yards & Docks, Navy Dept., Washington, D. C., plans the construction of a 2 story shop and storage building at Naval Air Station here. Estimated cost $200,000. Private plans.

N. J., Newark—J. B. Acocella, 9 Clinton St., Archt., will receive bids about July 1 for a 2 story, 100 x 150 ft. garage, etc., for owner, c/o architect. Estimated cost $150,000.

N. J., Newark—J. Black, 246 Central Ave., will not construct 2 story auto radiator shop and garage at 268-274 Central Ave. $40,000. Project in abeyance. Noted May 22.

N. J., Perth Amboy—General Cable Corp., 420 Lexington Ave., New York, N. Y., is receiving bids for 1 and 2 story, 56 x 85 ft. and 90 x 100 ft. factory buildings at De Kalb Ave. and High St. Estimated cost $40,000.

N. J., Roselle Park—Zoll Foundry Co., plans addition to foundry. Estimated cost to exceed $40,000.

N. Y., Brooklyn—Brooklyn Brass Works, L. Meier, Pres., Scholes and Waterbury Sts., will receive bids about July 1 for the construction of a 2 story, 24 x 100 ft. foundry. Estimated cost $40,000. Lee & Hewitt, 53 Park Pl., Archts. Noted May 22.

N. Y., Brooklyn—H. F. McLaughlin, 153 West 97th St., New York, will receive bids after July 15 for the construction of a service garage at Columbia and Creamer Sts. Estimated cost $60,000. J. F. McKenna, 58 Van Dyke St., Archt.

N. Y., New York—P. Cappell, 70 Bowery, is having sketches made for the construction of a 3 story service garage at 243 West 25th St. Estimated cost $200,000. J. Mitchell, 332 West 24th St., Archt.

N. Y., New York—J. A. Kennedy Realty Co., 381 South St., is having sketches made for the construction of a service garage at 575 Water St. Estimated cost $40,000. L. Sheinart and A. Fisher, 1476 Broadway, Archts.

N. Y., New York—Kidansky & Levy, 424 Madison Ave., is receiving bids for the construction of a 6 story, 75 x 100 ft. garage at 216 West 56th St. Estimated cost $175,000. J. J. Gloster, 1440 Broadway, Archt. Work will be done by day labor and separate contracts. Noted May 22.

N. Y., New York—J. Slattery, 26 Courtland St., will not construct service garage at 252 West 87th St. $100,000. H. J. Nurick, 44 Court St., Brooklyn, Archt. Project abandoned.

N. Y., New York—Two Hundred Forty-Five West 25th St. Realty Corp., S. Silk, pres., 50 Clark St., Brooklyn, will receive bids late in fall for the construction of a garage at 241 West 26th St., here. Estimated cost $300,000. Blee & Bryson, 16 Court St., Brooklyn, Archts.

N. Y., Tarrytown—Fisher Body Corp., Genearal Motors Bldg., Detroit, Mich., will soon award contract for addition to automobile body plant here. Estimated cost $650,000.

N. Y., Tonawanda—Ford Motor Co., Highland Park, Mich., plans the construction of a factory on River Rd. here. A. Kahn, 1004 Marquette Bldg., Detroit, Archt.

O., Cleveland—Lamson & Sessions Co., F. C. Case, Chn. of Board, 1971 West 85th St., manufacturers of bolts and nuts, awarded contract for a 1 story, 110 x 120 ft. addition to factory at 1971 West 85th St. Estimated cost $75,000. Noted May 15.

O., Dayton—Brown & Brockmeyer, 10 Norwood Ave., plans the construction of a plant for the manufacture of motors. Estimated cost $100,000.

O., Euclid (br. Cleveland)—Armington Engineering Co., S. F. Armington, Pres. and Treas., 1351 Chardon Rd., Cleveland, awarded contract for a 1 story, 80 x 124 ft. factory here. Estimated cost $40,000.

Pa., Erie—Erie Enameling Co., W. Spence, West 20th St., awarded contract for a 1 story, 60 x 120 ft. factory.

Pa., Philadelphia—Pennsylvania R.R., Broad St. Station, awarded contract for the construction of a machine shop, blacksmith shop, and oil storage building. Estimated cost $63,000. T. J. Skillman, Ch. Engr.

Pa., Pittsburgh—Reliance Steel Castings Co., 28th and Smallman Sts., J. A. Kelly, Pres., is receiving bids for a 2 story, 50 x 60 ft. foundry. Lake & Davidson, Negley Bldg., Archts. Noted May 8.

R. I., Pawtucket — United Electric Railway Co., 100 Fountain St., Providence, will soon award contract for a 1 story, 130 x 215 ft. bus terminal and repair shop on Newell Ave. Estimated cost $140,000. N. W. Sanborn, 100 Fountain St., Providence, Archt. Noted Jun. 5.

South Carolina — State Highway Dept., Columbia, will receive bids until June 19 for the construction of a group of maintenance shop buildings to consist of repair and blacksmith shops at Abbeville, Greenwood, Winnsboro, Columbia, Sumter, Camden and Kingstree.

Tenn., Jackson—Mobile & Ohio R.R., 7th and Pine Sts., St. Louis, Mo., plans the construction of a reclamation plant. Estimated cost $25,000. B. A. Wood, St. Louis, Ch. Engr.

Tex., Schertz—A. W. Parker, Constructing Quartermaster, will receive bids until June 27 for a group of buildings, including administration building, air corps shops, etc., at Randolph Field, 14 mi. north of San Antonio. Estimated total cost $664,000.

Wis., Milwaukee—Briggs & Stratton Co., 1047 13th St., is having sketches made for the construction of a plant for the manufacture of spark coils. Estimated cost $75,000.

Ont., Sidney—Radial Drill Co., Cincinnati, plans the construction of a 1 story factory here. Estimated cost $40,000. Private plans.

Ont., Welland—Page-Hersey Tubes Ltd, 100 Church St., Toronto, will soon receive bids for a 1 story, 75 x 800 ft. plant for the manufacture of tubes, pipes, etc. here. Estimated cost $2,000,000. Noted May 29.